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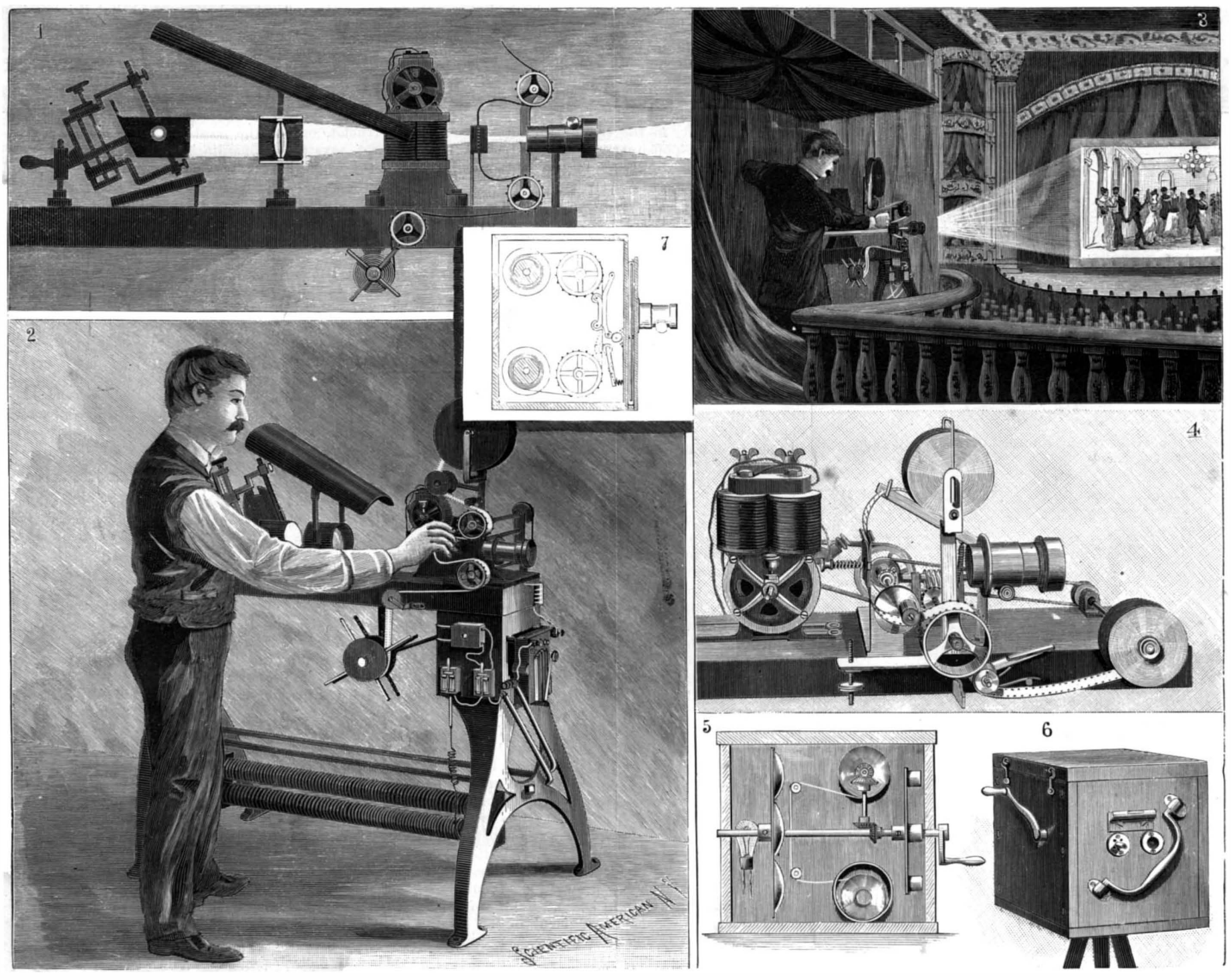
THE KINETOSCOPE STEREOPTICON.

Ever since the kinetoscope was brought to public attention and proved to be so popular, inventors have been striving to perfect apparatus for successfully projecting these miniature images upon the screen by means of a stereopticon producing the same effect of motion as in the kinetoscope. In the kinetoscope the successive images illuminated by reflected light are seen through a lens, enlarging them considerably, say from an image half an inch in diameter to about four inches. But the problem in the kinetoscope stereopticon was to successfully magnify these little images several thousand times and secure sufficient illumination on the screen to make them appear distinct and clear. Two factors in solving the problem have been the use of the electric arc lamp as an illuminant and of continuous transparent celluloid flexible films supporting the sensitive film and subsequent pictures, so that during this year several forms of apparatus have been invented, not only in this country but in England and France as well, for producing and projecting such miniature pictures. Most of our readers will recall the zoetrope toy, in which is placed a strip of pictures, the circumference of the cylinder being pierced with small vertical rectangular apertures. As the cylinder is rapidly rotated, the eye, in observing the pictures through the slits, only sees each picture the fraction of a second, and as one pic-

(Continued on page 331.)

KINETOSCOPE PICTURES—PRACTICING PUTTING THE SHOT.



1, 2, and 3. Edison Vitascope. 4. The Jenkins Phantascope. 5 and 6. Jenkins Kinetoscope Camera. 7. Acres Projection Device.

APPARATUS FOR PROJECTING KINETOSCOPIC PICTURES.

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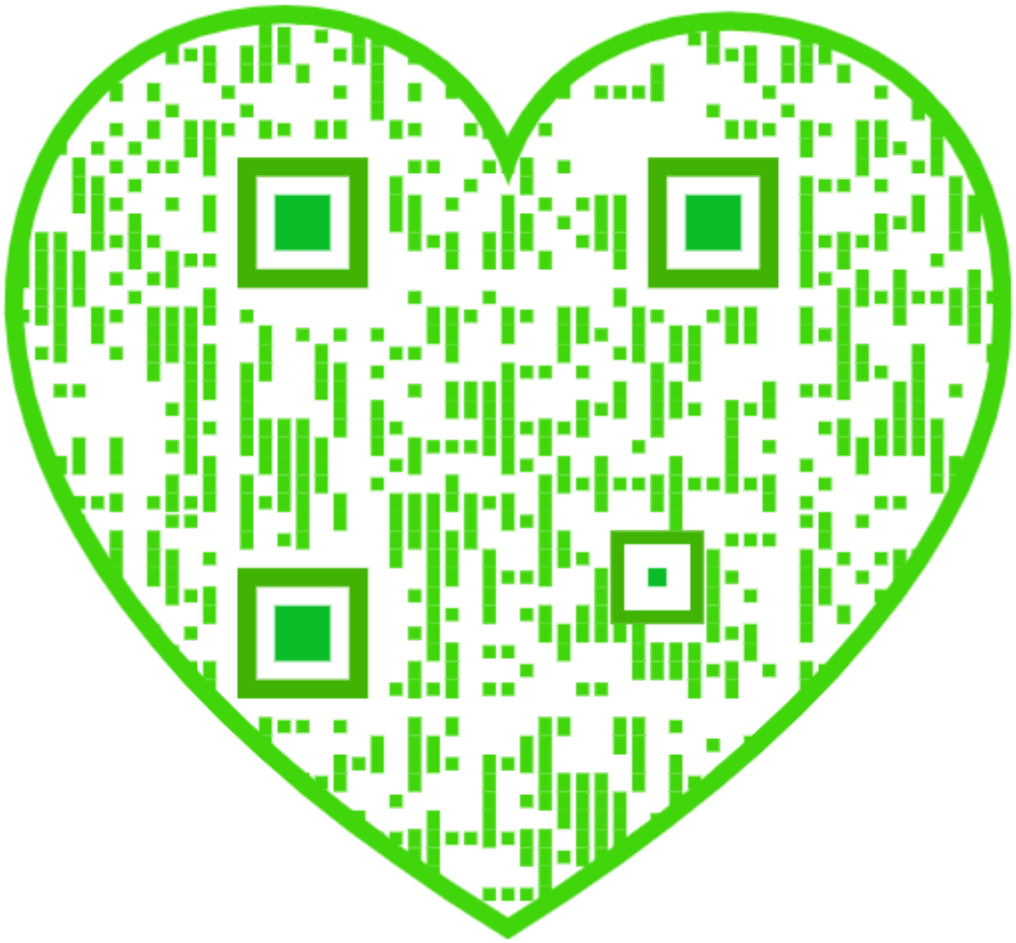

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THE SERIOUS SIDE OF THE AMERICAN CHARACTER.

It is a common fault of all who undertake to write and speak critically about the American people that they dwell too much upon the impulsiveness and feverish activity of our character, and overlook its less obtrusive and more serious side—its capacity for quiet reflection and sober second thought. It always will be, as it always was, a fact that essayists, novelists, journalists, every one indeed of that crowd, more curious than competent, that returns to Europe, after a brief visit to this country, to write "impressions," has proved how superficial those impressions were by losing sight altogether of that underlying spirit of reflection, that power and passion for the exercise of individual judgment, which is the fundamental fact upon which much of our social and national stability depends.

We have often had occasion to point out that our remarkable progress in the arts and manufactures is due to the inborn genius for invention which is possessed by the average American, and that this inventive faculty results largely from the active intelligence—"inquisitiveness" if you will—of the national character; the widespread interest which is taken by the individual in matters which may not come directly within the sphere of his daily life. The clerk in the store, the accountant at his desk, the farmer at the plow, always find time to follow with more or less attention the progress of science and discovery. The columns of the daily papers—the true mirror of a people's tastes and habits—are always freely sprinkled with scientific and technical matter and illustrations to an extent which finds no parallel in the press of any foreign country. It is not sufficient to state that the X rays can penetrate opaque bodies; the apparatus must be shown and its action explained. If Langley or Maxim has built a flying machine, the principles upon which it is designed must be stated and the mechanical forms in which they are embodied described.

If the American temperament is enthusiastic and impulsive, the American mind is thoughtful, logical and practical, and delights to get down to first principles. It is slow to accept any proposition on the mere ipse dixit of the speaker, however silver tongued he may be. This is abundantly manifest in matters of social and political economy, where questions which would ordinarily be considered as purely academic become the subject of careful study by the individual voter; and, although for want of time or opportunity he may not master the details, he will be pretty sure to get such a general grasp of the question that his vote will be based upon his personal convictions, and not upon the mere say so of a political candidate.

It is just here, in the thoughtful intelligence, the sober sense of responsibility of the individual citizen, that the guarantee of the permanence of our institutions is found, and it is in the combination of this serious intelligence with an unbounded enthusiasm and activity that the future rapid growth in wealth, power, and stability of the nation is seen to be assured. Herein we differ from the French nation, with whom we are so frequently compared. The Frenchman has the same freedom from the restraints of tradition, the same enthusiasm, the same active temperament; but he lacks the strong individualism, the power of independent judgment, the patient determination to study the merits of a question and get at the foundation truth. As a consequence the French people have been ever at the mercy of a Robespierre or a Marat, quick to rush into the excesses of a Reign of Terror or the bloodshed and pillage of a Commune. Our liberality and our level-headedness are at once the life and death of the demagogue in America. We are ready to listen to the man who comes with a plausible theory, and if at first sight it be in any degree reasonable, he will get a thoughtful, intelligent hearing. We have a passion for improvement, not merely in our mechanical industries but in our social life and in our municipal and national government.

The man with a new theory, who aims at the solution of a pressing difficulty, at the relief of a burden, the righting of a wrong, is likely at the first blush of its announcement to attract a ready following. It is in the tendency of the people to believe that there are few things so good but what they may be bettered that the political demagogue finds his vantage ground. Fortunately, however, the average American citizen has a way of getting off alone by himself and cracking the problematical nut upon the anvil of his own mind, and he generally finds the kernel of truth. History could furnish many a case in point. The greenback movement threatened at one time to roll across the country with the force of a tidal wave; but it fell harmlessly against the breakwater of the individual common sense of the people. To-day we are threatened, or, to speak more correctly, have been threatened, with a similar inundation of subversive and perilous teaching; and again, in spite of a temporary wavering, the calm judgment of the farming and artisan class is asserting itself. The crude, impracticable, and, indeed, fatal nature of the remedies which are being proposed for our financial distress is being disclosed to the judgment of the people.

The agitation will not have been without its lessons. It will have served to teach them that underlying all the forms and functions of government there are certain economic laws which belong to the very nature and essence of things, and can no more be changed, added to, or diminished than the height of a man's stature or the color of his skin.

And this thought suggests another. In our freedom from the trammels of tradition, are we not in danger of despising, or at least discounting, that great storehouse of the experience of other and older nations, the grain whereof has been garnered from civilizations whose centuries of life are measured by the score? We are not the only race that has wrestled with the problems of national existence. It is not written across the heavens by day or by night that national wisdom belongeth to us alone. Our peril indeed is the peril of youth, which, as it feels the rush of the fresh life blood through its veins, is ever prone to look pitifully upon age because it is old, and believe that its precepts must be worn out because the voice which utters them is so.

And side by side with this instinctive distrust of those lessons of national life which come from sources distinctly foreign, there is a danger lest our people should grow restless under the authoritative teaching of those specialists who have made a life study of the more difficult problems of government, such, for instance, as belong to the financial and diplomatic world. But, however great may be our belief in the right of individual judgment, it would be the blindest form of conceit to suppose that the average work-a-day citizen is independent of the ripe wisdom, the accumulated experience of those specialists who have devoted a lifetime to their own particular sphere of work.

Not the least alarming feature of the present political movement is the suicidal efforts of its leaders to divorce the affections of the people from those institutions and principles which have stood the test of time, not alone in this republic, but in the great republics and kingdoms of history.

Better the most cast iron conservatism than a liberalism which is lawlessness; that pulls down where it should build up; that sets man against man, class against class, and ultimately loosens those bonds, light as air yet strong as steel, which bind our great country into a union where we have proved that it is possible to have unity without uniformity.

M. Berthelot on Chemistry.

The International Congress of Applied Chemistry was held recently in Paris under the presidency of M. Berthelot, one of the most eminent chemists in the world, says the Humanitarian. M. Berthelot reviewed the whole history of chemistry in a masterly and lucid way and touched on microbes, mining chemistry and metallurgy. In dwelling on the astounding results of the alliance between chemistry and physics he discussed the whole problem of light and had some curious things to say on the new gas acetylene, which, however, he said, was even sixty years ago one of the coryphæi of chemical synthesis when it was formed by the direct union of carbon and hydrogen in the electric arc. By far the most important and suggestive portion of M. Berthelot's speech, however, was that in which he insisted on the difference between the modern era of applied science during the last three-quarters of a century and the whole development of the race during the last 6,000 years, a difference so marked that a new man was being created in a new earth and the entire social organization was being transformed amid conditions for the comprehension of which the past offered no suggestive precedents or data. That the continuous intervention of science is an unprecedented fact in human history is a point to which the great chemist again and again reverted, and it is in developing this idea that he is most convincing.

Paper Making in Corea.

It is not generally known that the best kinds of paper met with in China and Japan are the produce of Corea. Varat says that "the Corean paper excels the very best that is made in China and Japan." It is produced entirely by manual labor and without the use of any machinery. The raw material used for the better kinds is obtained from the bark of Broussonetia papyrifera, which is collected in spring and beaten in water containing a large admixture of wood ashes until reduced to thick pulp. This is taken in large ladles and spread upon frames of bamboo, so as to form thin sheets. Another kind of paper is made from old scraps trodden into pulp much in the same way that grape juice is expressed in some countries, and though this process of pulping is slow, it has the advantage of not breaking the fiber so much as when machinery is used. After the pulp has been made into paper the sheets are piled up to a height of six feet and then cut into pieces, to be again subjected to the stamping with the feet. At the same time the roots and seeds of a plant called "tackpoul" are added, the soluble parts of which are supposed to give tenacity and toughness to the paper.—Apotheker Zeitung.

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Princeton and Politics.

It was surely something more than a coincidence that the distinguished speakers in the various exercises of Princeton's anniversary laid strong emphasis upon the political sphere and duties of our colleges and universities. It showed that the din of the present political strife had disturbed the quiet of academic life, and that the tremendous issues at stake were weighing heavily upon every heart, even amid the festivities of a sesqui-centennial celebration. From the opening sermon by President Patton of the university to the closing address by the President of the United States, the speakers with unanimous voice urged the necessity for our colleges and universities exerting an active influence in the political affairs of the country—not the professional politics of the day, but the politics of Witherspoon and Madison, self-denying, patriotic, ennobling.

Very fitting and timely were the words of the president of the college, such, indeed, as might have come from Dr. Witherspoon himself:

"The essential morality of the people of our land as it finds expression in the pulpit and the press is a great source of comfort in a time of national peril. And yet, when fundamental authority is assailed, when revolutionary views of government are publicly expounded, when socialistic theories find plausible advocates, it will not do to rely altogether upon popular sentiment or the native common sense of the American people. We must do something to keep the common sense from being corrupted, and this must consist of something more than popular harangue and the florid iteration of the commonplaces of morality. There must be deep philosophical discussion of great public questions by men of acknowledged authority on political, social and economic science. This work can be done better in the universities than anywhere else. This is what I mean when I say that the university should be a school of patriotism."

In a similar strain were the words of Prof. Woodrow Wilson, the orator of the day:

"It has never been natural, it has seldom been possible, in this country for learning to seek a place apart and hold aloof from affairs. It is only when society is old, long settled to its ways, confident in habit and without self-questionings upon any vital point of conduct, that study can affect seclusion and despise the passing interests of the day. America has never yet had a season of leisured quiet in which students could seek a life apart without sharp rigors of conscience, or college instructors easily forget that they were training citizens as well as drilling pupils, and Princeton is not likely to forget that sharp schooling of her youth when she first learned the lesson of public service. She will not easily get John Witherspoon out of her constitution. It is not learning, but the spirit of service, that will give a college place in the public annals of the nation. It is indispensable, it seems to me, if it is to do its right service, that the air of affairs should be admitted to all its classrooms. I do not mean the air of party politics, but the air of the world's transactions, the consciousness of the solidarity of the race, the sense of the duty of man toward man, of the presence of men in every problem, of the significance of truth for guidance as well as for knowledge, of the potency of ideas, of the promise and the hope that shine in the face of all knowledge. There is laid upon us the compulsion of the national life."

So again on the following day, when the President of the United States commenced his address it was at once evident that its burden was the same: the political obligations of our colleges and universities:

"In a nation like ours, charged with the care of numerous and widely varied interests, a spirit of conservatism and toleration is absolutely essential. A collegiate training, the study of principles unvexed by distracting and misleading influences, and a correct apprehension of the theories upon which our republic is established, ought to constitute the college graduate a constant monitor, warning against popular rashness and excess.

"When the excitement of party warfare presses dangerously near our national safeguards, I would have the intelligent conservatism of our universities and colleges warn the contestants in impressive tones against the perils of a breach impossible to repair.

"When popular discontent and passion are stimulated by the arts of designing partisans to a pitch perilously near to class hatred or sectional anger, I would have our universities and colleges sound the alarm in the name of American brotherhood and fraternal dependence.

"When the attempt is made to delude the people into the belief that their suffrages can change the operation of natural laws, I would have our universities and colleges proclaim that those laws are inexorable and far removed from political control.

"When selfish interest seeks undue private benefits through governmental aid, and public places are claimed as rewards of party service, I would have our universities and colleges persuade the people to a relinquishment of the demand for party spoils and exhort them to a disinterested and patriotic love of their government for its own sake, and because in its true adjustment and unperverted operation it secures to every citizen his just share of the safety and prosperity it holds in store for all.

"When a design is apparent to lure the people from their honest thoughts and to blind their eyes to the sad plight of national dishonor and bad faith, I would have Princeton University, panoplied in her patriotic traditions and glorious memories, and joined by all the other universities and colleges of our land, cry out against the infliction of this treacherous and fatal wound."

And thus the opening and the closing words of Princeton's anniversary were fitting alike to the urgent need of the present and the glorious traditions of the past. In their eloquent appeals for a closer identification of the college life with the national life, the presidents of a college and a nation have reminded us that a man is his brother's keeper even if he live within the quiet seclusion of college walls. Dr. Witherspoon and his pupils thought so; and he himself assisted in the framing of the constitution of a nation which he had helped to liberate. It is for the successors of those early patriots to throw around that constitution those earthworks and defenses of an enlightened public opinion which are the best guarantee of its future integrity.

The Heavens for November.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

THE SUN.

The sun's right ascension at noon on November 1 is 14 h. 29 m. 35 s.; and its declination south of the equator is 14° 45′ 44″.

On the last day of the month, at noon, it is in right ascension 16 h. 29 m. 44 s.; declination south, 21° 49′ 18″, or within about 2° of its greatest southern declination.

Although the sun spots are near their minimum stage of periodicity, an occasional large group may be seen with the telescope, always, be it remembered, properly protected by a smoked or colored glass. Neglect of this precaution, even with small telescopes, let me say to the amateur observer, may lead to serious injury to the eye. In large telescopes, more elaborate methods for reducing the light and heat are imperative. The most refined method in direct observation of the sun is that of the polarizing eyepiece. With this apparatus the writer has observed the sun for long periods of time with perfect ease and comfort.

MERCURY.

The shy little planet Mercury is morning star at the beginning of the month, being then about one hour west and seven degrees north of the sun. It comes into superior conjunction with the sun on November 28, when it changes to evening star. Mercury is in conjunction with Saturn on November 19, at 3 o'clock in the afternoon, when Mercury will be 1° 50′ south of Saturn. On the twentieth of the month, at midnight, Mercury will be in conjunction with Uranus, being then only thirteen minutes of arc south of that planet.

VENUS.

Venus is evening star. It is rapidly increasing its apparent distance from the sun, on the first of the month being two hours east of the great central luminary. Its southern declination, however, offsets to a great degree this otherwise favorable relation. The best telescopic observations of Venus are made in the daytime. This is partly because of its higher altitude and partly to the cutting off of much of the dazzling brilliancy which the planet has on a dark sky—a shimmering radiance which renders Venus a glorious celestial gem to the naked eye, but exceedingly trying to telescopic definition.

On the twelfth of the month Venus is in aphelion, or at its greatest distance from the sun.

On November 1 Venus crosses the meridian at 1 h. 46 m. P. M., and sets at 6 h. 15 m. P. M. On the last of the month it crosses the meridian at 2 h. 27 m. P. M., and sets at 6 h. 57 m. P. M.

MARS.

Mars is now in good position for telescopic observation. Rising in the early hours of evening, it is at a good altitude before midnight. Its high northern declination—twenty-four degrees above the celestial equator—is also favorable for telescopic work upon this exceedingly interesting member of our planetary family.

Mars is apparently stationary in the northwestern confines of Gemini, on the first of the month being about one degree northward of the star Eta in that constellation. Throughout the month the planet will appear to slowly retrograde, or move westward among the stars. This is because the earth moves more rapidly in its orbit than Mars in its orbit. These relative orbital motions are made more evident near opposition than at other times. Mars is in conjunction with the moon on November 22, twelve minutes before noon, the planet being 2° 10′ south of the moon. Mars rises on November 1 at 7 h. 38 m. P. M., and is on the meridian at 3 h. 13 m. A. M. On the last of the month it rises at 6 P. M., and crosses the meridian at forty-nine minutes past midnight. The right ascension of Mars at the middle of the month, November 15, is 5 h. 51 m. 4 s., and its declination north 24° 55′.

JUPITER.

Jupiter is in the morning sky and may be well observed telescopically at five o'clock.

It is in the constellation Leo, about nine degrees eastward from the bright star Regulus in that constellation.

Jupiter is in conjunction with the moon on the morning of the twenty-eighth at 4 h. 18 m., when the planet will be 3° 8′ north of the moon. Jupiter is in quadrature with the sun on the last day of the month.

On November 1, Jupiter rises at 1 h. 12 m. A. M. and passes the meridian at 7 h. 48 m. A.M. On the last day of the month it rises at midnight, and passes the meridian at 6 o'clock in the morning. The right ascension of Jupiter on November 15 is 10 h. 39 m. 43 s. and its declination north 9° 29′ 43″.

SATURN, URANUS, AND NEPTUNE.

Saturn is in conjunction with the sun on November 13, at 9 A.M.

Uranus is also in conjunction with the sun on the morning of November 16, at 10 o'clock; and hence both these planets are invisible.

Neptune is in the morning sky in the constellation Taurus.

Its right ascension on November 1 is 5 h. 16 m. 24s.; declination north, 21° 37′ 58″. Its apparent motion is slowly retrograde.

THE NOVEMBER METEORS.

A display of the November meteors should be watched for on the mornings of the thirteenth and fourteenth. The grandest shower is expected to occur in 1899, being the recurrence of the great showers of 1833 and 1866; but good displays are expected for the next few years as we approach the maximum period. The radiant point of these meteors is in the constellation Leo, and from this fact they are often called the Leonids. The weather proving favorable, an attempt will be made by the writer to photograph this shower of meteors every year, until after 1899 at least, and should he succeed, reproductions of the plates will be laid before the readers of the SCIENTIFIC AMERICAN.

Smith Observatory, Geneva, N. Y.

Production of Chrome Ore in Turkey.

Mining industry in Turkey has hitherto been much neglected, and it is only during the last few years that permission to sink shafts has been granted. This has led to a considerable increase in the output of ores of all kinds. The Montan und Metall Industrie Zeitung says this is especially the case with respect to chrome ore, which is worked on a large scale in the vilayet of Kossovo, where it exists in considerable quantity, being chiefly exported to Germany and Great Britain, and in a less degree to Austria-Hungary, where it is treated especially at Hrastiugg, in Carinthia. Up to 1894 the chrome mines were worked by the Ottoman government without firman—that is, without special authorization from the Porte; and the small quantity of ore raised found a ready market. At the present time the chances in favor of working chrome mines are improved, on account of the concessions granted by the Turkish government, which authorizes the extraction, without firman, of two hundred ten ton wagon loads on payment of a government tax of nine Turkish pounds, with an export duty of half a Turkish pound per wagon (Turkish pound equals $4.50). When there is a firman the government tax is reduced one-half, and there is no limit to the quantity which may be extracted. In 1895 Germany received from Turkey, through Hungary, more than 8,000 tons of chrome ore.

The Danube Ship Canal.

The great engineering work of removing what is known as the "Iron Gates," in the River Danube, has been completed, and on September 27 the new canal was formally thrown open to navigation, with elaborate ceremonies, by Emperor Francis Joseph. His Majesty was accompanied by King Carol, of Roumania, and King Alexander, of Servia. The procession of steamboats which passed through the Iron Gates showed how successfully the work of removing the obstacles to navigation has been accomplished. For forty years the passage of the Iron Gates has been difficult and possible only on an average of 117 out of the 225 days during which navigation is open. The obstruction between Bazias and the Iron Gates has been removed and a canal has been excavated through the Prigada and other reefs of the Iron Gates along the southern or Servian side of the river. The canal through the rocks is about two miles long, 260 feet wide, and 10 feet deep, so that the Danube will now be navigable for the largest river steamers from Vienna to the Black Sea. The whole work cost nearly $10,000,000, and owing to carlessness in blasting operations, some 200 workmen lost their lives. The opening of the Danube to easy navigation will doubtless develop the Danube traffic to a tremendous extent. The formal opening of the canal was the crowning feature of the Hungarian millennium festival.

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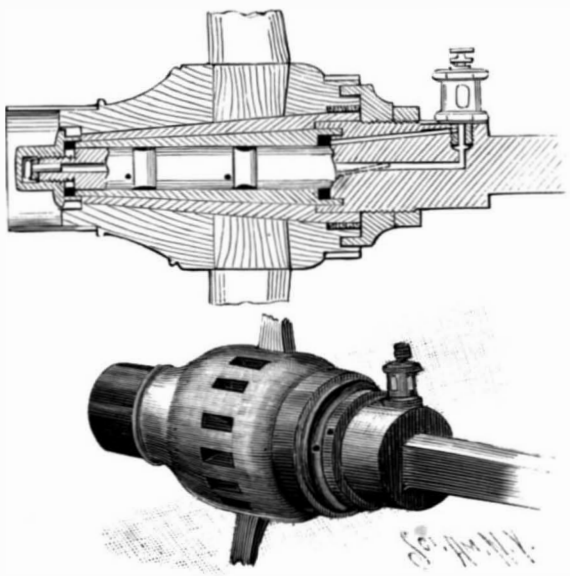
AN AUTOMATIC AXLE LUBRICATOR.

The illustration represents, in longitudinal section and perspective, a novel oiling device for the axles and wheels of vehicles, which is simple and reliable in construction and automatic in operation, lubricating the axle spindles and boxes of the wheels for a considerable period of time without replenishing the lubricant, and rendering it unnecessary to remove the wheels in supplying the lubricant. The improvement has been patented by Addison C. Holt, of Lynchville, Me. An oil cup communicates with a vertical passage in an en-



HOLT'S VEHICLE AXLE OILING DEVICE.

larged portion of the axle spindle, and this passage communicates with another which extends centrally through the spindle, and from which branch lateral feed passages, that cut through the outer surface of the spindle. From the vertical passage below the oil cup a smaller supplementary oil passage also leads, with a slight inclination, to the packing ring in the hub box. An outer cap nut draws the wheel hub into correct position on the spindle, and when the vehicle is moved oil is automatically fed from the cup into the lubricating passages. The spindle of the axle works automatically to distribute the oil with or without the oil cup, and there are shallow peripheral grooves in the spindle to receive any residuum that may form from the lubricant. The supplementary oil passage lubricates the spindle by infiltration through or around the washer, should the other passages become clogged. and a flanged collar perfectly excludes dust or other impurities from the joint between the spindle and its box.

A NON-REFILLABLE BOTTLE.

The invention shown in the illustration relates to that class of bottles known as "safety bottles," which are designed to prevent the refilling of the same after the contents have been removed. It has been patented by Mr. Henry C. Small, of 16 Cushman Street, Portland, Maine. The neck of the bottle is provided at its upper end with a deep fillet, and at a suitable distance below the bottom edge of the fillet an annular bead or rim is also formed on the neck. A glass cap,

SMALL'S NON-REFILLABLE BOTTLE.

Fig. 2, is provided, which has a slightly thickened lower edge, adapted to rest, when said cap is adjusted over the neck of the filled and corked bottle, upon the annular bead. The annular space between the cap and the neck of the bottle is filled with some hard, quick drying cement, or, if preferred, the lower rim of the glass cap can be fused down upon the bead. The contents of a bottle sealed in this way cannot be removed without breaking the cap, and when this is done the bottle is practically destroyed for the purpose for which it was originally used, as any attempt to use it a second time would be certain of detection. The cap, moreover, forms a hermetical seal for the bottle, and it may be made in colors and utilized as a trade mark.

Science Notes.

All interested in physics will hear with regret of the death of Mr. Hippolyte Fizeau, which has taken place at age of 77. Mr. Fizeau will, of course, be remembered for his classical researches on the measurement of the velocity of light, not to mention his other work in physical optics and allied branches of science.

Prof. Thomson, in his address to section A of the British Association recently, sums up our knowledge in regard to the true nature of X rays in the following words: "Though there is no direct evidence that they are a kind of light, there are no properties of the rays which are not possessed by some variety of light."

The death is announced of M. Henri Aimé Resal, the distinguished mining engineer, at the age of sixty-eight. He was a member of the Academy of Sciences, president of the Société Mathematique de France, editor of the Journal des Mathematiques Pures et Appliquées, and author of numerous treatises on mining and mechanics.

A member of the Zurich Medical Society recently exhibited a self-registering clinical thermometer on which there were no degree marks. The instrument could be left with the patient's family to take the temperature in the absence of the physician, and the latter could then read it by means of an attachable scale of glass or metal.—Medical Record.

Foreign medical students in France have had their position defined by the minister of public instruction. They are divided into two classes. Those wishing to practice in France must produce a French diploma of bachelor of arts or some equivalent diploma; others will be allowed to complete their studies, but their diplomas will not give them the right to practice in France.

A monument in memory of the mineralogist and poet, Franz von Kobel, was unveiled in Munich on July 19, says Science. Franz von Kobel, who died in 1882, was for over fifty years professor of mineralogy in the University of Munich and made many contributions to all departments of the science, and was also well known among the people for his poems in the Bavarian dialect.

A second International Art Exhibition will be held in the city of Venice from 22d of April to 31st of October, 1897. The exhibition will contain pictures, sculptures, etchings, and drawings. Signor Filippo Grimani, mayor of Venice, is the president of the exhibition. The total amount of prizes to be awarded to artists will not be less than 40,000 lire. Prizes will be given for the best critical essays on the exhibition.

We have it on the authority of Prof. W. Ramsay and J. Norman Collie that, by fractional diffusion through porous tubes, argon yields two portions, of which the lighter has a density of 19·93, the heavier of 20·01. Similar experiments with helium gave densities of 1·874 and 2·133 for the two extreme portions, results which were confirmed by measurements of the refractive indices by Lord Rayleigh. Both specimens, says Nature, gave spectra which were absolutely identical, and hence the possibility is suggested of there being here a true separation of light molecules from heavy molecules of the same substance

The attention of the biological section of the British Association was drawn to the construction of microtomes by a communication from Prof. C. S. Minot, of the Harvard Medical School, Cambridge, Mass. In recent years there has been a growing and justified demand for microtomes to make good sections of great thinness, if possible, not over one five-hundredth of a millimeter or 2 microns (0·002 mm.) In the automatic microtome, worked by a revolving wheel, devised by Prof. Minot, which was now made in England, Germany, and France, as well as in America, the attempt is made to secure mechanical perfection, and so far successfully that sections of 1 300 mm. may be made with it. This microtome is, however, adapted only to cutting objects embedded in paraffin.

A paper on a new method of preparing alloys was recently read before the Paris Académie des Sciences by M. Moissan, according to whom alloys of refractory metals can be prepared by projecting a mixture of the oxide with powdered aluminum into a bath of liquid aluminum. The heat set free by the oxidation of the aluminum is sufficient to carry on the reaction. Alloys of aluminum with nickel, molybdenum, tungsten, uranium, and titanium have been obtained in this way. In a paper entitled "A Study of Melted Vanadium and its Carbide," M. Moissan says: Vanadium pentoxide, reduced by carbon in the electric furnace, yields an ingot of metal which always contains an appreciable amount of carbon. If the time of heating is as short as possible, a metal containing only 5 per cent of carbon can be obtained; by prolonging the time of heating the percentage of carbon is increased to 18·5 per cent, indicating the formation of the carbide VC. The carbide is not attacked by water at the ordinary temperature. Vanadium forms alloys with iron, copper, and aluminum, but not with silver.

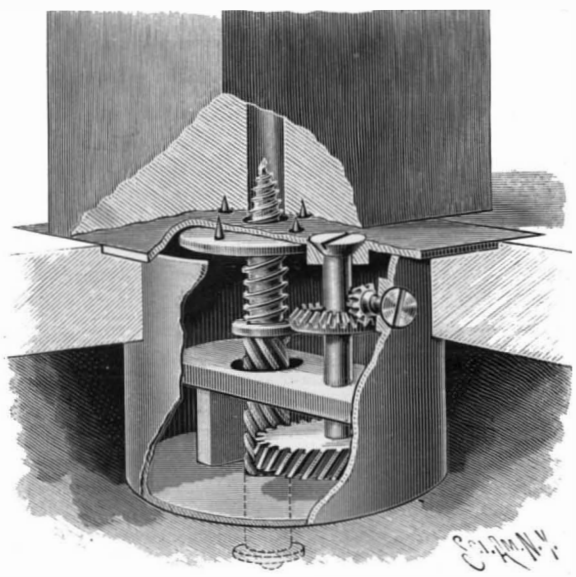
A Great Lens Finished.

The lens for the great telescope of the new observatory at Lake Geneva, Wis., the finest and largest telescope lens in the world, has been completed after two and a half years' labor, and now lies at the workshop of Prof. Alvin Clark, in Cambridge, awaiting the orders of the Chicago University authorities. Its focal distance is 61 feet, the extreme diameter of the clear aperture is 41⅜ inches. The crown is about 3 inches thick at the middle and 1¼ inches thick at the outer edges, and weighs 205 pounds. The flint weighs 310 pounds. The lens and its iron ring and cell weigh about 1,000 pounds.

The cost of the glass plates in Paris was $40,000, and the entire cost of the lens is estimated to have been $100,000. For its journey west it will be wrapped in flannel and bedded in curled hair in a box mounted on springs and packed with excelsior in a larger box. It will ride in the center of a parlor car and will be accompanied by four men.

A NOVEL POST FASTENING.

To facilitate the securing of standards or posts to a flooring without damage to the floor, as may be desirable in the erection of removable partitions in office buildings, etc., the improvement shown in the accompanying illustration has been invented and patented by Joseph Schmidt, of No. 257 East Seventy-eighth Street, New York City. A suitable metal casing is made fast in an opening formed in the floor, the top plate being flush with the floor, and a screw adapted to engage the bottom of a post is arranged to move vertically in the casing and through a hole in the plate. This screw has on its lower end a flange adapted to engage the bottom of the casing, and its lower portion has a worm engaged by a worm wheel on the lower end of an upwardly extending adjacent shaft adapted to be turned by a screw driver, or it may have a squared end adapting it to be turned by a wrench.



SCHMIDT'S POST FASTENING.

Resting on a collar on the vertical screw is a plate carrying pointed lugs which extend up through openings in the top plate to pass into the lower end of the post and afford additional security to that given by the central screw when the latter, rotated by the shaft, is turned into the post. If desired, the casing may be placed in the lower end of the post and the screw made to engage the flooring, and for this purpose a beveled gear is placed on the turning shaft, the gear meshing with a pinion on a short shaft extended through the side wall of the casing and adapted to be engaged by a turning tool. The improvement is also well adapted for use in the placing of rail posts, stair posts, etc.

Artificial and Natural Petroleum.

Writing to the Echo des Mines, M. Francis Laur draws attention to the unexpected discovery of the artificial production of petroleum, which, he says, starts a new question of great interest to scientists, as to whether petroleum is an ancient deposit in the earth's surface or is being reproduced to-day in the lower series of measures. Those who consider that the production of petroleum is contemporaneous are, says M. Laur, unable to account for the method of its formation, and have to be content with the mere hypothesis of certain obscure reactions which took place in the bowels of the earth. Now, however, it is only needful to invoke the presence of the metallic carbides which exist in the central nucleus, and which can be reached by the water which is sucked in through the earth's crust, so that it is rational to suppose that firedamp, acetylene, petroleum, tar, and inflammable gases of all kinds may be produced and infinitely modified by the difference of pressure and temperature. Arguing from this point, M. Laur suggests that Lake Baku must, if this is the case, be the outward and visible sign of a natural production of hydrocarbides, while the Caspian Sea, whose issue has not so far been determined, but whose boundary does not grow less, may be regarded as a natural means of feeding the important internal laboratory where the petroleum is produced.

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THE GRANT MONUMENT.

The accompanying picture is from a recent photograph, and illustrates the present condition of the work on this imposing structure, of which the corner stone was laid with so much state and solemnity in the spring of 1892. The magnificent location of the monument, at the north end of Riverside Park, on beautifully laid out grounds high above the river, renders it a conspicuous object from all parts of upper New York, as well as from Long Island Sound to the eastward, from far down the bay to the south, and over quite an area of the territory of New Jersey to the west, so that the progress of the work upon it has been, from the first, an interesting subject of general observation and concern.

The lower portion of the monument is 100 feet square, its four sides facing the points of the compass, and the main entrance being on the south side. Its height from the base line will be 160 feet, or nearly 300 feet from the water level of the Hudson River. Over four of the six Doric columns forming the entrance will be equestrian statues of four generals who commanded under Grant, and the monument is to be surmounted by an appropriate statue or group. In front of the monument will be a colossal equestrian statue of Gen. Grant, and in the entablature over the portico will be worked the coats of arms of the several States, designs of weapons and flags being worked into the cornices above. The pyramid at the top ascends by steps or terraces, and below it are windows through which visitors may look from the inside, an outer gallery being 130 feet above the ground line, and the extreme top being reached by steps above this gallery.

The design is the work of John H. Duncan, of New York City, who designed the Soldiers' and Sailors' Memorial Arch at the entrance of Prospect Park, Brooklyn. For the entire work velunteer subscriptions have been made by the public to the extent of about five hundred thousand dollars, the last three hundred and fifty thousand dollars having been raised by the energetic work of the Grant Monument Association, under the able direction of its president, Gen. Horace Porter.

THE GRANT MONUMENT APPROACHING COMPLETION.

Aerial Flights.

Elaborate experiments in aerial locomotion are in progress at Dune Park, Northern Indiana, near Lake Michigan, under the direction of Mr. Octave Chanute. The experiments began two months ago. Since then the machines have been reconstructed. Mr. A. M. Hering is assisting Mr. Chanute, and has invented a regulator, which is attached to the apparatus. Beginning September 1, a large number of flights have been made without a bruise or a break. A distance of 300 feet has been covered, at the height of say 30 feet from the ground, with less jar and shock than a ride in a rubber tired carriage. Two men carry the apparatus up the sand hill. At a height of 35 feet up the machine is lifted, and Mr. Hering fits himself under it and allows the wind to raise it. His arms fall over the bars provided. He makes two or three quick steps toward the lake, and the machine soars from the ground and darts through the air with a velocity described as rivaling that of an express train. The motion is horizontal, without any swaying motion. To stop the machine, the operator moves his body enough to tilt the apparatus slightly upward in front, when it coasts gradually and slowly to the ground. The experiments of September 10 were considered unusually favorable, because made under somewhat adverse conditions. In a strong wind the aeroplane soared suddenly and unexpectedly, carrying with it four operators who were holding the ropes, and lifting them 100 feet into the air. The combined weight of the four brought it down again soon, without accident; while the performance of the machine in this emergency was peculiarly gratifying to the inventor. The apparatus is modeled after the general form of an albatross, but has seven wings.

Fluorescent Screen for Roentgen Rays.

R. W. Buttemer gives the following instructions for making a fluorescent screen: Brush over a piece of black card with gum, and sift the salt over it. I have used this method with calcium tungstate (scheelite); but this salt, though brilliant, phosphoresces as well as fluoresces, thus giving a foggy image after a few consecutive trials. Or, mix the powdered salt with collodion (flexible, i. e., containing a percentage of castor oil), and coat the card or aluminum foil with it. I have found this method most successful with barium platino-cyanide on aluminum foil. Or coat the card or foil with dilute flexible collodion, and sift the salt over it. I have used this method with Melckebeke and Van Heurck's fluorescent salt, which appears to be an organic salt of uranium. But in all cases success depends on finely powdering and sifting the (carefully dried if necessary) salt. I use 120 to the inch.—Photography.

A Voice from Colorado.

The SCIENTIFIC AMERICAN of October 10 contains a very interesting and finely illustrated article on "Tall Buildings of New York." Besides giving reasons for their erection, and much additional matter concerning their use and cost, it presents a table of acreage covered by them, from which we glean that there are over 87 acres of floor space above the seventh story, 1¼ acres above the twenty-third story, and 0·02 acre on the twenty-ninth floor in that city. The tallest building is in Park Row—387 feet; six stories above the pinnacle of the spire of Trinity Church. The SCIENTIFIC AMERICAN, by the way, is one of the most entertaining, as well as instructive, papers in the United States.—The Herald, Eaton, Colorado.

Curious Inventions.

Take out inventive genius, says the American Artisan, and this would be a sorry world. A mere enumeration of some of even the lesser wonders that a wave of the magician's wand of Yankee ingenuity has given the word is full of suggestion. Here is a little wrinkle of invention that is simplicity itself. The larvæ of nocturnal moths have always been a bete noir to apiarists, as they have a great predilection for honey and young bees. Automatic machinery run by clockwork for opening and closing these hives would be quite expensive. Inventive genius tackles this problem and finds a ridiculously sinple solution. When the hens go to roost, their weight on the perch may be utilized for actuating a mechanism which shuts the doors of the beehives. When the shrill chanticleer welcomes the dawn of another day with his cock-a-doodle-do and the hens fly down to go worm grubbing, the doors of the beehives open again.

The two little strips of cork on the nose pieces of eyeglasses make them vastly more comfortable, as many of us can personally testify, yet optical science had shaken off her swaddling clothes for quite a number of years before the cork strip came forward.

Other inventions that we have noted from a perusal of that most interesting volume, the Patent Report, are artificial hens' eggs, where shells are made by a blowpipe from a moist composition of lime and gypsum. The whites are made of sulphur, carbon and beef fat, and the yelks of beef blood and magnesia colored with chrome yellow. May we be delivered, exclaims the Artisan editor, adding, the good old-fashioned hen egg is good enough for us.

A month or two ago a patent was issued to a man who had a hat-raising contrivance. By contracting the brows your hat would be automatically lifted in case you met a lady acquaintance. For armless men this might be a good thing. Another inventor wants to go the Takamine process one better and give us a seaweed whisky. If that would not make us see sea serpents, I don't know what would.

If another patented scheme works all right Oklahoma gentlemen won't make work for the St. Louis and Chicago coroners any more by blowing out the gas, as the breath tilts a delicately balanced electrode and gives an alarm in the office of the hotel. There is a pneumatic sole for shoes to lessen the jar of walking, and a process has been patented for weaving textile fabrics from thread spun from peat. A talking watch contains a miniature phonograph and cries out the hour when the stem is pressed. The idea of punching pin holes in eggs to keep them fresh by supplying the contents with fresh air has been patented. A washable paper, from which writing in ink may be removed after the lapse of any time, is made of rag pulp, glue and asbestos. The manufacture of it has been forbidden in Germany, because it might help fraud. Another patent is for making gold leaf so thin that four million sheets are required for an inch thickness. This sort of gold leaf is deposited by electricity on sheets of copper and is quite transparent.

MR. C. A. MITCHELL reports in the Analyst the results of an analysis of human fat, according to which it consists of about seventy per cent of liquid acids, principally oleic acid, thirty per cent of solid acids, probably palmitic, with small amounts of stearic and myristic acids, and traces of lower volatile acids.

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How to Prolong Life.*

As the question of food enters so largely into the subject of long and healthy life, some suggestions seem called for in regard to what may be considered most suitable for persons of sixty and upward. It has been urged that a return to nature, or to the food which primitive man nourished his body upon, would be the right thing to do. Fruits and nuts appear to have been his dietary, and not flesh and vegetables. Oranges, apples, grapes, figs, bananas, dates, prunes, peaches, and, in fact, all kinds of sweet fruits and tomatoes are good, because they are deficient in nitrogen and free from the earth salts of other kinds of food. Starchy foods are more difficult to digest than fruits and meats. Nuts, such as almonds, Brazil nuts, filberts, walnuts, hickory nuts, and similar products abound in nourishment and furnish the necessary heat for the body. Eggs, fish, cheese, milk, especially buttermilk, and poultry of all kinds supply variety. Starch foods are clogging to the system, producing constipation. Invalids are always put upon toasted bread, because the heat acting upon the starchy portions turns it into dextrine; this, being changed to glucose by the action of the stomach, is easily disposed of. Glucose is the sugar of nature as found in ripe sweet apples and in honey.

Tea, coffee, wine, and beer, as well as all alcoholic drinks, are to be taken in extreme moderation, as they are mere stimulants and have no nutriment, or at least very little. Milk is a better drink. As every one knows, if you eat slowly, you do not need to drink at all. And that is one of the great advantages of a fruit diet. You get enough of the best quality of water distilled by nature in the fruit, which is also aperient and cooling to the blood, already too much heated by starchy foods. Exclusive vegetarianism seems to be injurious to the human system. But people who advocate a diet of fruits and nuts, omitting starch foods and too much bread, are not vegetarians; for they get the heat and strength necessary for health from nuts, lean meats, lamb, veal, and young animals whose systems have not had time to get clogged with the objectionable earth salts. If fresh fruit cannot be obtained at all times, dried figs, raisins, and dates can be steeped in hot water and thus brought to an almost fresh condition. As for whole meal or Graham bread, the merit that it may have is offset by its irritating effects upon the stomach and intestines, produced by the indigestible bran particles. Sugar furnished by nature in the form of glucose is ready for assimilation; on the contrary, sugar from cane, beets, maple, and sorghum is insoluble by the system until it has undergone the process of digestion, both in the stomach and the intestines. Now, as salt, pepper, and all irritants, as well as stimulants, are goads to the nervous system, the human body, if treated naturally, does not require them. Animal instinct indicates the law of nature. Since Cuvier's time zoologists have been telling us that man belongs to the frugivorous animals. He is allied to the manlike apes, which live entirely on nuts and fruits, never eating other animals or cereals.

Dr. DeLacy Evans in his book "How to Prolong Life" gives over twenty pages to tables of analyses of foods. As compared with the nourishment they give, fruits and nuts have the least proportion of earthy salts. Animal flesh comes next, then vegetables, and fourth in rank we have cereals and pulses, which are shown to have the largest amount of the earthy matters. From the analysis we see that fruits as distinct from vegetables have the least amount of earth salts. We also notice that they are to a great extent free from the oxidized albumens — glutinous and fibrinous substances; and many of them contain acids—citric, tartaric, malic, etc.—which when taken into the system act directly upon the blood by increasing its solubility, by thinning it; the process of circulation is more easily carried on and the blood flows more easily in the capillaries—which become lessened in caliber as age advances—than it would if of a thicker nature. These acids lower the temperature of the body and thus prevent the wasting process of oxidation or combustion in the system. Rice is easily digested and an excellent food, except that it abounds in earth salts. Fruits are not only digested in the first stomach, but they have a large part of their nourishment already in a condition to be absorbed and assimilated as soon as eaten. The food elements in bread and cereals have to undergo a process of digestion in the stomach, and then be passed on to the intestines for a still farther chemical change before they are of use to the human system. This is the great advantage of a diet of lean meats and fruits.

Overwork is not expected from a stomach already jaded, and the nervous wear and tear of the organs of life are avoided. Distilled water should always be used both for drinking and cooking, if it can be obtained. Rain water, if filtered, is perhaps the next best, though not free from objections. Grapes, say numerous authorities, act very much like mineral waters on the human system. But they are better, because at the same time they nourish the body. Nutrition is increased, secretion promoted, action of the liver, kidneys, and other excretory organs improved, and the phosphoric acid, of which they contain a considerable amount, acts favorably on all the bodily functions, especially on the brain. As is well known, the sugar of the grape requires no digestion, but is taken almost at once into the blood. Dextrine from the grape promotes the secretion of pepsin and thus favors digestion. Most of the vegetarians eat grapes, though they may prefer pease. Stimulants often assist digestion, but that digestion is best which does not need them.

* William Kinnear, in the North American Review, August. Condensed for Public Opinion, from whence our copy.

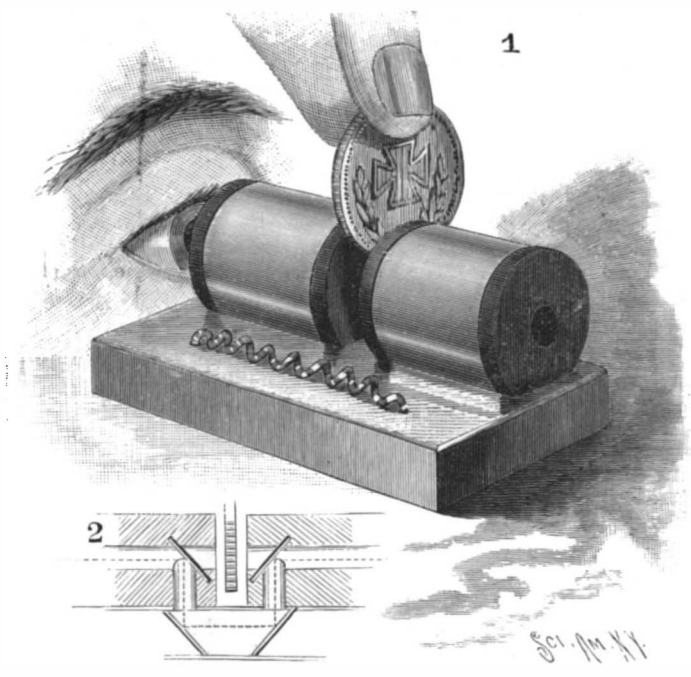
BULLETS FUSED BY IMPACT.

Mr. H. L. Bridwell, of Cincinnati, sends us an interesting photograph, which we reproduce. He says: "This is a ball from a Springfield rifle pierced by a ball from a Krag-Jorgensen rifle (the new army magazine gun), and was picked up by Lieut. B. W. Atkinson, 6th U. S. Infantry, on the army rifle range near Ft. Thomas, Ky. (near Cincinnati). The large ball was buried in the turf during rifle practice about three years ago, and has been struck and pierced by the steel-jacketed nickel-plated bullet of the new rifle, which has fused the two together by the heat.

AN OPTICAL ILLUSION.

The simple toy illustrated in the engraving has printed on the underside the rather high sounding title "X Ray Machine. Wonder of the age!" But it is neither an X ray machine nor a wonder. It is simply a reduced copy of an ancient trick. The two cylinders mounted on the base with a space between them are perforated axially and are supposed to represent coils. When the eye is applied to the end of one of these cylinders, objects may be clearly seen through them, and when a coin is slipped between the ends of the cylinders as shown in the cut, it offers no obstruction to the light. Objects can apparently be seen through the coin. Fig. 2 affords an explanation. The hole in each cylinder is intercepted by a mirror arranged at an angle of 45° with the axis of the cylinder, and in the base are two mirrors arranged parallel with the first two as shown. A hole extends downward from the central hole of each cylinder, so that light entering at one end of the machine is reflected downward at right angles by the first mirror, thence forward by the second mirror to the third, which throws it up to the fourth mirror, by which it is reflected to the eye. It will thus be seen that the light never passes entirely through the cylinders, and the observer does not see through but around the coin.

The old device which preceded this was on a much larger scale, and was generally used in connection with a brick, which, of course, had the same transparency as the coin.



X RAY MACHINE WITH NO X RAY.

Street Railway Association.

The fifteenth annual meeting of the American Street Railway Association began at St. Louis, Mo., October 20. The Auditorium was used for the convention, and all of the space not needed for the seating of delegates and visitors was filled with a display of street cars and appliances. Everything pertaining to the business was on exhibition. Necessarily the electrical appliances formed the greatest part of the exhibition, the latest and most novel developments in that line being shown. While electricity dominated everything within the building, the cable men had an exhibit outside which attracted much attention, a mammoth cable being the chief attraction. The papers were of great interest.

The Ocean Mail Service.

Capt. Brooks, superintendent of the foreign mails service, has prepared a statement showing the number of trips made a year by the transatlantic steamers, the average time occupied in each trip and the quickest time made in conveying the United States mails from New York to London and to Paris during the year ending July 1. The number of hours stated does not indicate the time consumed in the voyage only, but the period elapsing between the actual receipt of the mails at the post office in New York and their delivery at the post office in London or Paris.

The statement of the quickest time made by the respective lines is as follows:

Cunard (New York to London, via Queenstown).—Lucania, 11 trips, 157·1 hours; Campania, 12 trips, 158·1 hours; Etruria, 12 trips, 169·5 hours; Umbria, 13 trips, 174 hours; Servia, 2 trips, 201 hours; Aurania, 7 trips, 201·9 hours.

Hamburg-American (New York to London, via Southampton).—Fuerst Bismarck, 7 trips, 170·3 hours; Normannia, 7 trips, 144·7 hours; Augusta Victoria, 7 trips, 178·1 hours; Columbia, 6 trips, 177·1 hours.

White Star (New York to London, via Queenstown).—Teutonic, 13 trips, 170·2 hours; Majestic, 12 trips, 173·6 hours; Germanic, 11 trips, 197 hours; Britannic, 13 trips, 210·4 hours; Adriatic, 2 trips, 232·3 hours.

American (New York to London, via Queenstown and via Southampton).—New York, 15 trips, 172·1 hours; St. Louis, 13 trips, 168·6 hours; St. Paul, 10 trips, 169·7 hours; Paris, 12 trips, 179·2 hours; Berlin, 3 trips, 218·4 hours.

North German Lloyd (New York to London, via Southampton).—Havel, 12 trips, 184·6 hours; Lahn, 10 trips, 183·1 hours; Aller, 9 trips, 190·5 hours; Spree, 12 trips, 186·1 hours; Trave, 8 trips, 191·5 hours; Saale, 9 trips, 196·3 hours; Ems, 5 trips, 199·7 hours; Fulda, 4 trips, 201·2 hours; Kaiser Wilhelm II, 1 trip, 219 hours; Werra, 1 trip, 226·7 hours.

General Transatlantic (New York to Paris, via Havre)—La Touraine, 10 trips, 186·3 hours; La Bretagne, 6 trips, 194·1 hours; La Bourgogne, 12 trips, 199·5 hours; La Champagne, 7 trips, 196·9 hours; La Gascogne, 10 trips, 200 hours; La Normandie, 7 trips, 201·6 hours.

Tidal and Seismic Waves.

Alluding to the recent disastrous storm on the Atlantic coast, the New York Tribune remarks, in relation to what are termed tidal waves in connection with these storms, that they were merely very high and stormy tides, swelled to unusual height and fury by the wind. They inundated low-lying coast towns and swept away some buildings. They differed in no respect save degree from the ordinary tides that daily flow and ebb. Strictly speaking, every flowing tide is a tidal wave, and a mighty wave it is too, as it is seen in such places as the Bay of Fundy, or, still more notably, in the bore that rushes up the Amazon, the Hoogly and other rivers.

The same name has sometimes been applied, with less propriety, to the most dreadful of all ocean phenomena, namely, the waves caused by earthquakes or submarine eruptions. Such was that at Lisbon, in 1755, which rolled up the Tagus forty feet high, and that on the coast of Peru in 1868, which carried the United States warship Wateree a mile and a half inland and left her there, stranded high and dry, and that on the coasts of Java and Sumatra in 1883, when the Krakatoa eruption turned day into night and reddened sunsets all over the world for weeks and months. Such a wave has this year raged upon the coast of Japan with a devastating fury compared with which the "tidal wave" on the Florida coast seems but a gentle summer surf.

According to the official report of the Japanese government, there was no warning of this catastrophe. The barometer gave no indication of trouble. The weather was fair, the sea was calm. A slight earthquake shock was felt, a common enough thing in that part of the world. Then a booming noise was heard a little distance out at sea, swiftly increasing until it was like the roar of a dozen batteries of artillery. Then, in a moment, three waves rolled in, each from thirty to fifty feet high, one close behind the other. Within two minutes all was over. The coast was ravaged for more than 200 miles. A score of ships were stranded far inland; as many towns and villages were wholly swept away, 12,000 buildings were destroyed, and 20,000 lives were lost. Scientists call that a seismic wave, as it truly was, having absolutely nothing to do with the tides, and being caused directly and entirely by seismic disturbance of the ocean bed. From such our coasts are, happily, exempt.

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THE KINETOSCOPE STEREOPTICON.

(Continued from first page.)

ture after another merges into the next, the sense of motion is conveyed to the brain. Carrying out this plan with scientific accuracy is what the kinetoscope and similar machines do. Various projecting machines have been introduced under such names as the vitascope, the phantascope, cinematographe, kineopticon and bioscope, and have been in use in several of the variety theaters of this city. Our illustrations describe more particularly the vitascope, said to be designed by Mr. Edison, but which is similar in detail and construction to the phantascope invented by Mr. Charles F. Jenkins, who has originated new ideas concerning the details of projection and of the mode of taking the original pictures. Mr. Jenkins has furnished us with a series of photographs made with his camera, shown in our upper engraving. The various successive motions of "practicing putting the shot" are shown in these fifteen pictures, and may be traced by beginning at the lower left hand corner and reading upward for each column of pictures.

His device for taking the views is shown in Fig. 5, exterior Fig. 6. On a shaft is fixed a disk supporting four lenses, and geared to the shaft is a smaller shaft arranged vertically, engaging a bevel gear on the axis of the film-winding reel. As the shaft is revolved by the handle outside, the lenses are brought respectively behind the opening in the front of the box and transmit the momentary image, as they pass the opening, to the moving sensitive film going in the same direction as the moving lens and at the same speed, the exposed film at the same time being wound up on the top reel. With the same apparatus the positive pictures on a roll of film may be reeled off from one spool to the other, being projected by the electric light in the rear, and illuminated by the rotating condensers, one for each lens, to the eye looking through the lens aperture or upon a small screen, reproducing in sequence the motions as originally taken. By this method the use of slitted rotating disk shutters is avoided; there is greater illumination, more detail in the pictures and they may be made somewhat larger, which greatly assists in their better reproduction on the screen.

The pictures are made at the rate of twenty-five to a second, about three-quarters of an inch in diameter and one-quarter of an inch apart, on a continuous sensitized celluloid strip about one and a half inches wide, having perforations in its edges in which the sprocket wheels of the projecting device engage.

Fig. 1 shows the complete projecting apparatus having in the rear a compact Colt electric arc lamp, in front of that a condenser, next in advance of that the ribbon picture film traveling from the upper to the lower reel, and finally the lens for projecting the illuminated image on the screen. On the rear, between the condenser and film, is observed the electric motor for operating the feed mechanism. Fig. 2 is another view of the stand complete showing the resistance coil used to modify the strength of the current, running lengthwise between the two ends of the stand, switches, etc., for regulating the application of the current. The film, after passing behind the lens, is wound up on the reel below.

In Fig. 3 the use of the apparatus in a theater is shown. It is placed in a cabinet surrounded by curtains in an upper gallery, the images being thrown forward upon a screen erected on the stage. In projecting pictures of this kind it has been usual to employ shutters operating in unison with the movement of the picture ribbon, but after a series of experiments it was found the same effect of motion could be produced by causing the ribbon itself to have an intermittent movement without the use of shutters at all, which greatly simplified the apparatus. Allowing that twenty-five images pass before the lens per second, it has been ascertained that the picture may remain stationary $\frac{11}{12}$ of that interval and another picture substituted in the remaining $\frac{1}{12}$ of the interval without destroying the continuity of effect as observed by the eye. The film-working device, based on this idea, will be seen more in detail in Fig. 4. The electric motor operates a main shaft, to which is geared a worm engaging a gear on the shaft of the main sprocket pulley that draws the picture ribbon downward at a uniform speed. Back of this shaft may be seen the main shaft, intended to rotate rapidly, on the end of which is a disk having a roller eccentrically fixed thereto. Just behind this is the standard, supporting spring tension fingers through which the film passes.

The operation is as follows: From the supply reel at the top the picture ribbon passes downward through the spring tension fingers behind the lens, and, as it is drawn forward by the main sprocket pulley, is quickly pulled downward by each rotation of the rapidly moving eccentric roller on the disk, which movement changes one picture for another. The sprocket pulley meanwhile takes up the slack of the ribbon, so that at the next rotation the eccentric roller quickly pulls the film down and makes the change. From the sprocket pulley the film is carried to the winding reel, operated automatically from the main shaft by means of a pulley, or, when it is desired to repeat the subject over and over, the endless film is allowed to drop into folds in a box located under the sprocket pulley, passing out of the rear upward over pulleys, arranged above the tension spring fingers, downward between them again to the main pulley.

Fig. 7 is a diagram of a film-moving mechanism of an English inventor, Mr. Birt Acres, which has been successfully operated in London.

The picture film is taken from an upper reel passed over a sprocket pulley downward through a retaining clamp and over a second pulley at the bottom and winding reel. The film passes over both sprocket pulleys at a uniform speed, between a stationary and swinging clamp operated automatically from the shaft of the shutter and holds the film stationary when the opening of the shutter is behind the lens, during the interval the picture is projected on the screen. The clamp is then released, then the pivoted lever below, with a roller on the upper end and pulled inward at the other end by a spring, immediately takes up the slack (as shown by the dotted lines), and causes, by such sudden movement, the bringing of the next picture into position.

There are several plans for making the quick change necessary. That designed by Lumiere Brothers, of France, is said to be one of the most compact. The film is carried forward intermittently by a pawl and ratchet movement.

The effect of these enlarged pictures in motion on the screen is very pleasing and novel, those we have seen illustrating marching soldiers, railway trains approaching a station, street episodes, ocean surf, Niagara Falls, bathing scenes, dancing girls, and the life in aquariums being remarkably natural and effective.

Worked in unison with the phonograph, it may be possible in the near future to reproduce an opera, illustrating each movement of the actors, including the grimaces and peculiar expressions of their faces, assisting greatly thereby the understanding of the phonographic music.

What other possibilities may be in store for these twin instruments remains for future developments to determine. The kinetoscope stereopticon may certainly be set down as one of the novel improvements for the year 1896.

Removable Backing for Dry Plates.

The most common complaint, in reference to backing plates to prevent halation, seems to be the "messiness" of applying the mixture to the glass. Personally, we find none of this annoyance; and we believe that others who have ever actually undertaken to back a plate realize that there is really very little mess or trouble about the operation. The universal demand is for a sort of removable backing that can be attached to a plate in an instant and stripped off as quickly; but these, as a rule, are rarely effective.

The following plan, recommended by Dementjeff, looks more promising than any other we have yet heard of:

A sheet of glass is cleaned and talced, and the talc is removed from the edges to the width of about a quarter of an inch. The plate is then coated with enamel collodion and allowed to dry; it is then placed on a leveling stand and coated with a 10 per cent gelatine solution to which a little glycerine has been added.

When this substratum is dry, the plate is coated with colored gelatine, prepared as follows:

Twelve parts of gelatine are allowed to swell in 90 parts of water, melted in a water bath, and then 8 parts of sugar and 80 parts of glycerine are added. The mixture is then colored with aurine, chrysoidine, and methyl violet; the following proportions being used:

Gelatine solution (as above)	60 parts.
Saturated alcoholic solution of chrysoidine	2 "
" " " aurine	2 "
" " " methyl violet	½ "

The film will be in proper condition for use in about two days, when it may be stripped from the glass and cut into suitable sizes. It is used as a backing, by merely squeegeeing into contact with the back of the plate with a roller squeegee. It can be easily stripped after use, leaves no stain, and may be used again and again.—The Amateur Photographer.

MANY physicians, according to a lecturer on dietetics, are ordering thin bread and butter for delicate patients, especially those suffering from dyspepsia, consumption, and anæmia, or any who need to take on flesh. This thin bread and butter insensibly induces persons to eat much more butter than they have any idea of. It is extraordinary, says the lecturer, how short a way a pat of fresh butter will go if spread on a number of thin slices of bread. This is one advantage, and a great one, in the feeding of invalids, for they are thereby provided with an excellent form of the fat which is so essential for their nutrition in a way that lures them to take it without rebellion. But the thin bread and butter has another advantage equally as great—it is very digestible and easily assimilated. Fresh butter made from cream is very much more digestible when spread upon thin slices of bread than the same amount of cream eaten as cream, per se, would be.

Correspondence.

The Scientific American Supplement as an Archæological Journal.

To the Editor of the SCIENTIFIC AMERICAN:

Two large and well sustained literary societies in the city in which the writer lives were recently engaged in an antiquarian research of considerable range, and while in pursuit of authentic and up-to-date archæological matter, found that the SCIENTIFIC AMERICAN SUPPLEMENT afforded more news and more substantial information in that field of inquiry than all other publications in America put together.

Pages upon pages of its ample volumes, during the last twenty years, have been devoted to the most entertaining, not to say fascinating, descriptions and illustrations of discoveries in Assyria, Babylonia, Egypt, Yucatan, Peru, Mexico, and indeed in every land in which the archæologist has delved to reveal the treasures of his science or lift the incubus of error and doubt from the pages of history.

More than fifty articles have appeared in the SUPPLEMENT on Egypt alone within the period named, and on other fields in similar proportion. Has this generous and persistent labor in the dissemination of knowledge been properly appreciated or encouraged? It is hoped that the rapidly increasing interest in archæological studies during the last few years will soon bring the deserved reward and stimulate further effort in popularizing a science by whose lamps only can we learn what man is by what man has been.

I have a hundred volumes of the three editions of your journal, all bound and convenient for reference, and find that no cyclopedia is equal to them.

Defiance, O. CHARLES SEYMOUR.

Non-conductive Glass.

The Illustrirtes Fachblatt notes a new variety of window glass invented by Richard Szigmondy, of Vienna, the peculiar virtue of which is its non-conductivity for heat rays. It is stated that a light of glass a quarter inch thick absorbs 87 to 100 per cent of the heat striking it, in contrast to plate glass, which absorbs only about 5 per cent. This glass is to give us a window which will keep our dwellings warm in winter and cool in summer, and be especially adapted to skylights, etc., and also to blue glass spectacles for the use of furnace men. In noticing this invention, it might be well to call attention to the peculiar conducting power of ordinary glass, which would seem to render Szigmondy's glass an impossibility in some of its claims at least. If we stand by a window on which the sun shines, we may feel the warmth of the sun, but if we touch the window pane, we find it cold. If we now take a light of glass and place it between us and an ordinary open fire, it will screen us from the heat, but will become rapidly heated itself. In the first case it transmitted most of the heat, and in the latter it absorbed. Plate glass may absorb but 5 per cent of sun heat, but it absorbs 94 per cent of heat from a source of 400°. In general it might be stated that glass transmits the luminous heat rays, and absorbs the non-luminous rays, and this is why a light, sunshiny room is so warm in winter. The glass transmits the heat of the sun and absorbs the heat of the fire. If Szigmondy's glass is opaque to luminous rays, it will keep a house cool in summer, but tend to make it warmer in winter, as glass non-conductive at one time is non-conductive at all times. We should be interested to know of the satisfaction it gives in actual use.

How Gold was Deposited.

An exhibition of the greatest interest to mineralogists and practical miners in relation to the much argued question as to how gold was originally deposited in auriferous quartz is reported from the Imperial Institute at Edinburgh, Scotland, says the Electrical Age. J. C. F. Johnson, of Adelaide, Australia, who has given great attention to the subject, exhibited specimens of non-gold-bearing stones in which he has artificially introduced gold in interstices and on the face in such a manner as to defy detection, even by skilled experts. Some of these specimens were shown privately to several distinguished geologists, who expressed great surprise at the remarkable character of the exhibition. The discovery, some years ago, that gold could be induced to deposit from its mineral salt to the metallic state on any suitable base, such as iron sulphide, led Mr. Johnson to experiment with various salts of gold, and by which he has produced most natural looking specimens of auriferous quartz from stone which from previous assay contained no trace of gold. Moreover, the gold, which penetrates the stone in such a thorough manner, assumes some of the more natural forms. In one specimen shown the gold not only appears on the surface, but penetrates each of the laminations, as was proved by breaking. While this knowledge of how gold was probably deposited may help to suggest how it may be economically extracted, the thought also occurs what a power for harm it would be, in unscrupulous hands, for the fraudulent "salting" of mines.

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THE MILK INDUSTRY.

The rural industries which have their bases in milk, although necessarily few, are very important. In portions of the country where the land is fertile but untillable, farmers own large herds of cows which roam the hills and dales, and which constitute the chief source of revenue. This state of things exists in some portions of almost every State, and it is interesting to note the improvements in dairies and dairy products. The farmers, instead of setting the milk to allow the cream to rise, carry the milk from one to four miles to a creamery, where they sell it for so much a pound.

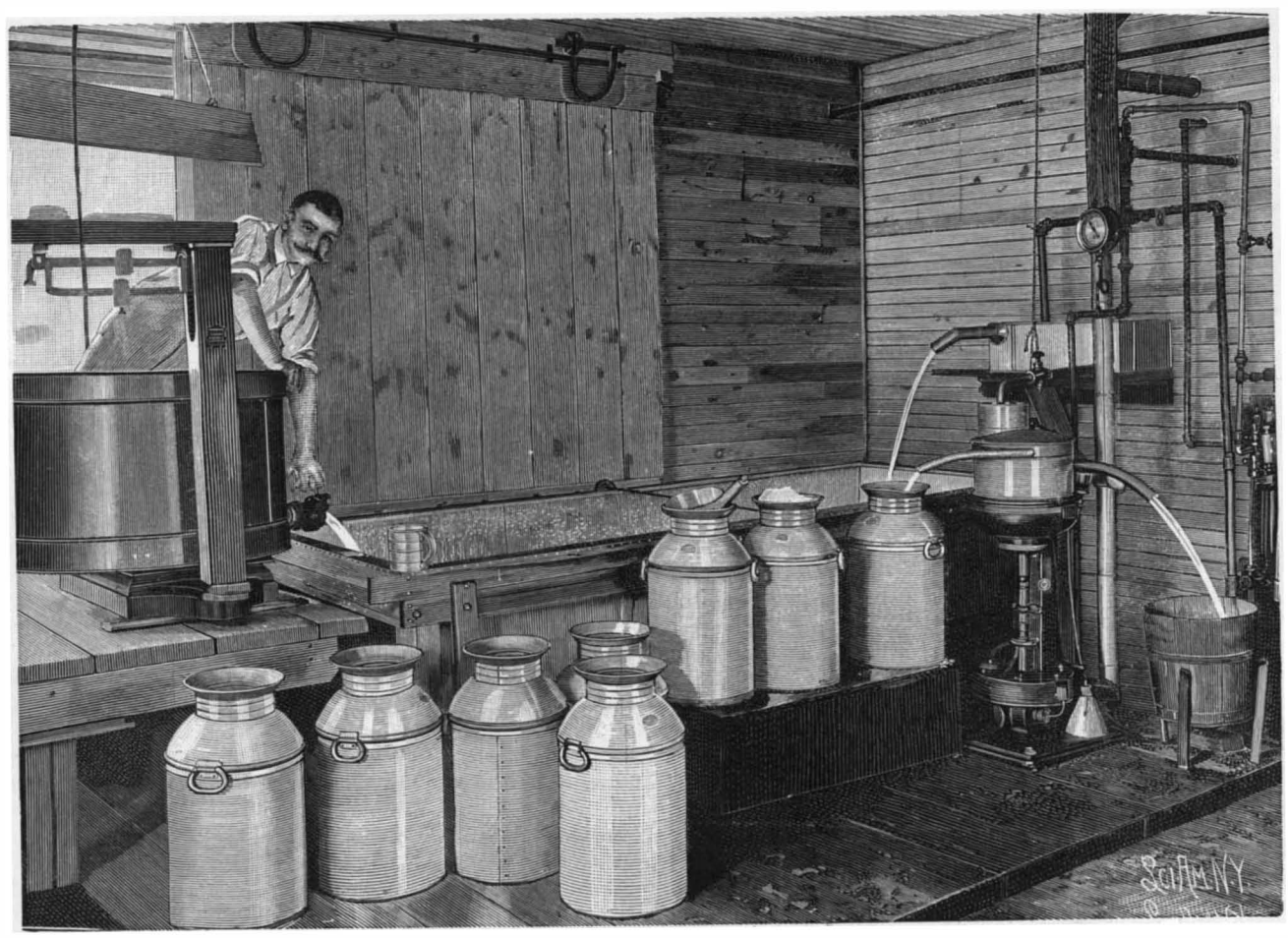
The first of our engravings shows the exterior of one of these establishments, the other the interior. The farmers, in a long train, stand waiting to dispose of the milk and to receive the skimmed milk. The illustration shows a farmer receiving his proportion of the skimmed milk from the tank on the roof—after having emptied his cans into the weighing tank on the scales standing on the platform in the doorway. The cans are lifted by the attendant of the creamery by means of a small crane, and while in an elevated position their contents are poured into the weighing tank.

Within the building, as shown in the second engraving, is placed a large tank not unlike a huge bath tub. Into this tank the milk is allowed to flow after it has been weighed. At the side of the tank is located a double steam pump which pumps the milk from the tank into a small reservoir raised four or five feet from the floor. At the side of the milk tank and near the reservoir is placed the separator, a very interesting piece of mechanism, which separates the cream from the milk and also removes the impurities. The separated milk flows into a tub from which it is pumped to the tank on the roof, while the cream flows through another discharge spout into the cream can. The machine is unerring in its operation, throwing off one-tenth of the volume of the milk as pure cream and nine-tenths as skimmed milk. To maintain a constant supply to the separator, the small reservoir receives a surplus of milk which flows back into the large tank. The bowl of the separator which receives the milk is mounted on a vertical shaft, to the lower end of which is directly connected a steam turbine. This turbine makes 6,500 revolutions per minute. At this enormous speed the cream is rapidly and completely separated from the milk by centrifugal force, the milk going to the outside of the bowl, the cream being discharged from the inner portion of the bowl. This machine is capable of separating 3,000 pounds of milk per hour.

BRINGING MILK TO THE CREAMERY.

The milk is brought to the creamery between the hours of 4 and 8 or 9 in the morning, and after the day's work is done the machine is taken apart and all the pieces, including 42 cones contained in the bowl, are thoroughly scalded and cleaned. The cream is taken to a dairy and converted into fine butter. In the case here illustrated the creamery is one of four which supply the dairy. The creameries are so located as to accommodate the greatest number of farmers. The skimmed milk is taken away by the farmers and used for feeding calves and hogs. The creamery naturally does the greatest amount of work during the summer months. The amount of butter made in the summer months from the cream furnished by four such creameries is as follows: May, 50,751 pounds; June, 62,661 pounds; July, 55,254 pounds; August, 58,660 pounds; September, 54,840 pounds.

The creamery which we illustrate is located at Middletown Springs, Vt.



INTERIOR OF CREAMERY.

MARSEILLES has just finished its drainage system on the model of that of Paris, at a cost of $4,600,000.

The Czar's Imperial Train.

The imperial train of the Czar of Russia is one of the finest specimens of car building which Europe has ever been treated to the sight of. It was begun in 1892 at the Alexandrofsky works, which are located near St. Petersburg, and was completed in 1894. As the gage of Russian railways is different from that in other countries of the Continent, special trucks were built to admit of being used on railways outside of Russia, the change being quickly effected. The train has been used considerably since it was built, and this last journey of the Czar is probably the longest trip in which they have taken part. In Russia a train identical with this as to the exterior is used. The two trains are changed at various points on the road, so that it is impossible to tell in which train the sovereign travels. This is rendered necessary by the danger from Nihilists. The train is composed of eleven cars, and is 990 feet long, the largest car being reserved for the dining room and the saloon, which is beautifully decorated with rich brocade and contains a religious picture. The dining room is somewhat simpler, but the whole train is an example of the most rigorous attention to the smallest details. The service of the train is in the hands of twenty-six persons, under the charge of the chamberlain of the Czar. Special attendants are employed to care for the Czar's train. Compartments for sleeping are provided, so that the entire force can rest at some period of the day if long journeys are to be made. The car body is high above the rails, so that steps are let down when stops are made. The entire train is lighted by electricity generated by a special plant on one of the cars, the capacity of the system being two hundred lamps. The boiler to supply the lighting engines is in the same car and also serves to heat the train. Each car of the imperial service has also its own heating system. The cooking arrangements are perfect, a spacious galley being provided. Most of the cars are corridor cars, so that it is impossible from the outside to tell where the Czar is at any one time. In case of a breakdown, a small shop stocked with tools is provided.

ACCORDING to researches on tungsten, by M. H. Moissan, the pure metal is readily obtained by the reduction of tungstic acid with carbon in the electric furnace. With a large excess of carbon the carbide CW_2 is formed, which, in the fused state, readily dissolves more carbon, graphite crystallizing out on cooling. Pure tungsten can be readily filed and forged, it welds easily, has no action upon a magnetic needle, and has a melting point higher than chromium and molybdenum.

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THE RUINS OF EUYUK, CAPPADOCIA.

On May 28, says Madame B. Chantre (in her "Souvenirs of a Voyage through Cappadocia"), we approached Euyuk or Oyuk of Aladja, the first halting place of our archæological campaign. It was in a pouring rain that we perceived the eminence upon which stands the present village, improperly called Euyuk, since in Anatolia the name of "euyuk" is given to what the Arabs call "tell." We made a tour in order to find the ornamented facade or grand entrance, of which we saluted the sphinxes—the enigmatic guardians of the temple or palace erected here by men whose names and epoch archæologists are not yet sure of having found. However this may be, these remains of an unknown and strange civilization are well calculated to strike the imagination and excite the sagacity of savants.

Let us recall, in the first place, that we are here in the district known among the ancients by the name of Pteria. This poor and small canton of ancient Cappadocia does not at present bear any particular name. It is comprised in the sandjak of Yozgat. By its naturally strong situation and by the difficult access of its gorges, this Pteria has been regarded by certain travelers as a sort of redoubt and natural fortress. The brief description left by Herodotus of the region where the battle between Crœsus and Cyrus took place seems also quite justly applicable to this country. It was Crœsus, the Lydian king, who destroyed the cities of Pteria, upon the site of which the ruins of Boghaz-Keni and Euyuk are found.

There rose, then, of old, upon this latter point, an artificial hill. Upon this eminence, a sort of vast platform analogous to the tells of Assyria and Babylonia, there was constructed a temple or palace whose present ruins were discovered by Hamilton, and finally visited by Messrs. Perrot, Guillaume, and Delbet. A view of the eminence and the trenches that he dug there promptly confirmed Mr. Perrot in the opinion that he was in the presence of a tell analogous to those of Mesopotamia, and under which Khorsabad, Kouyoundjik and Nimrod were found buried. According to him, the edifice was a palace constructed after the plans of a Ninevite one for some Cappadocian prince.

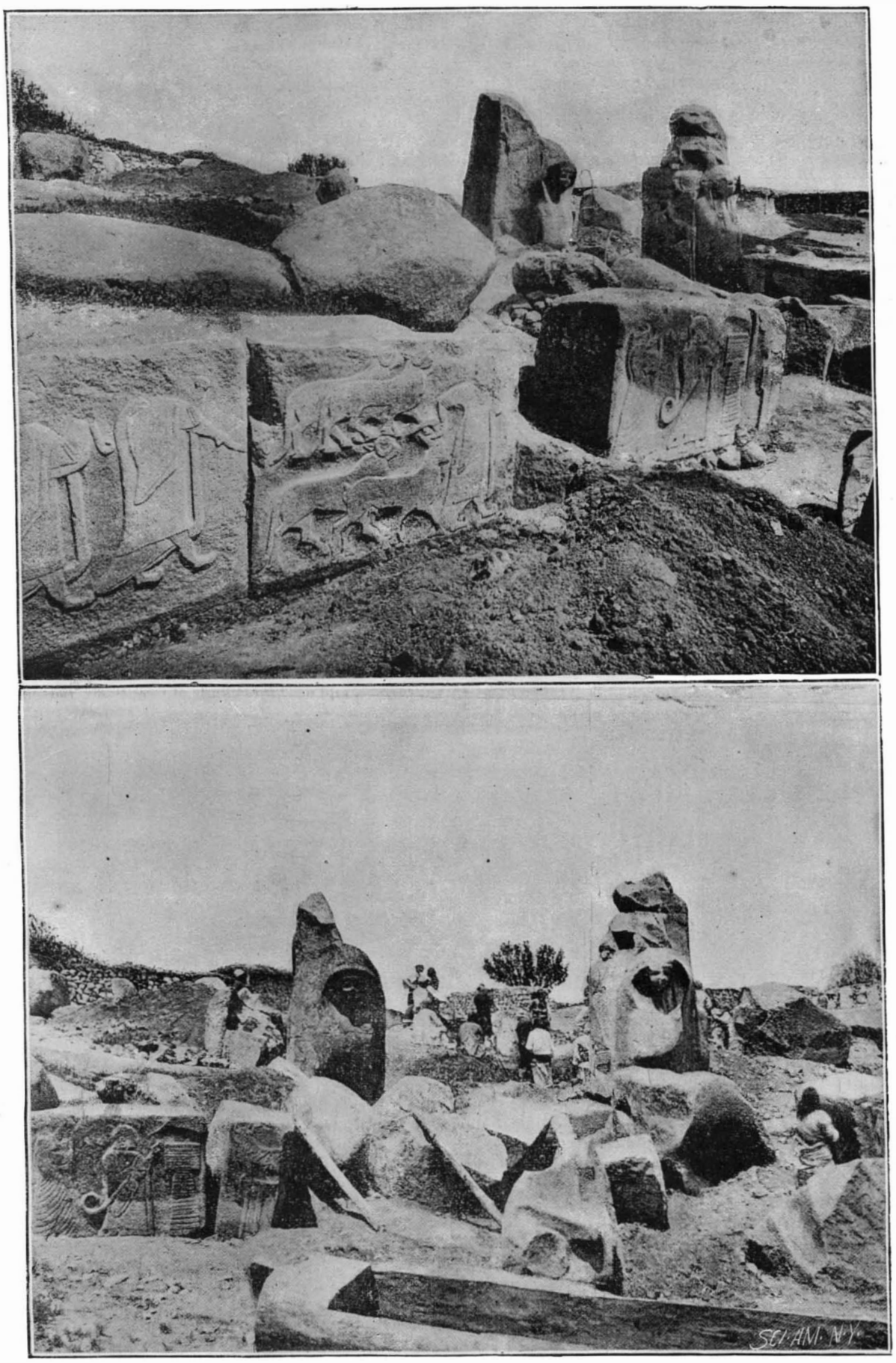
At present, only one of the four faces of this tell is ornamented, and this is regarded as the grand entrance of the palace. This southern door, with its jambs formed of two rudely sculptured sphinxes, along with the row of bass reliefs that extends to the right and left, still offers a majestic ensemble. There was here, indeed, an entrance worthy of a royal palace; but, this facade excepted, the tell seems to conceal no other doors, nor any walls nor any traces of construction whatever, either in its other faces or upon the esplanade occupied by the present village. Aside from quite a thin stratum of dust derived from the modern habitations, the tell is formed of light earth, and not of a mass of ashes or of dust resulting from the crumbling of baked bricks, as in the palaces of Mesopotamia.

Our impression is that the construction of an edifice, palace or temple was undertaken at this point, but that it was never finished. Upon the esplanade, in the interior of the village, there lie here and there a few blocks of stone designed for sculpture, and especially two rough hewn lions that must have been left by the workmen just as we find them.

From the opinion of all the inhabitants, it seems that the soil of the eminence is not, aside from a little pottery, very rich in antiquities. On the contrary, in the immediate vicinity of the tell the plow sometimes brings to light the debris of one of the most archaic industries, in which must be seen the vestiges of the Pterian town.

While we were taking photographs and squeezes of everything that appeared interesting to us among the curious scenes of the bass reliefs, fifty men armed with picks and shovels were digging up the door sill and the rock-encumbered space that formed the vestibule. The absence of a crowbar rendered the displacement of these heavy stones very difficult. Let us now examine the bass reliefs, which are still aligned quite regularly to the right and left of the grand entrance. It would seem from the arrangement of the sculptured blocks that the series to the left, all of whose scenes point in the same direction (save the first bass relief of the entrance, representing a bull standing upon a sort of altar), must be interpreted as a procession going to meet the sacred bull. A number of priests and animals on the march seem to announce a religious ceremony during which a goat is to be sacrificed. It is not impossible that the Heteans gave a place of honor in their pantheon to the bull (the symbol of strength), whose worship reigned in all antiquity in Asia Minor, especially in Cappadocia and the Sicilian Taurus. All these scenes, the animals and the personages, are very realistic.

The series to the right is not in so good a state of preservation, since it has greatly suffered from the installation in the vicinity of a laundry, in which the Euyuk women use their tongues and beaters with equal ardor. The last bass reliefs are in this laundry, and it is not convenient to visit them. This series represents a procession, also directed toward a seated goddess that corresponds to the bull in the other. The goddess, who is genuinely Hetean, holds a cup or a flower in her hand. The defaced state of the sculpture renders the determination of it difficult. Here, again, we have a suite of eunuchs and priestesses in the performance of mysterious rites defiling before our eyes. Whither are they going? What divinity, good or bad, is symbolized by this seated woman, whose head is almost like that of a cat?



BASS RELIEFS AND RUINS OF EUYUK.

The sphinxes that constitute the jambs of the grand entrance are standing, and not seated. The headdress and paws are not Egyptian. They have nothing of the type of the sphinxes of Egypt, and reflect merely a vague reminder thereof. One of them bears upon the internal face a bicephalous eagle—a strange bird that seems also to have a very Hetean character. The eagle must have supported a priest or a god upon its outstretched wings, since we still see a trace of two shoes with recurved points and the tail end of a long robe. Near this symbolic bird there are some hieroglyphics, of which we obtained squeezes.

Our excavations, which were made in the interior part, forming a vestibule, showed us that the latter, provided with walls to the right and left, terminated in a second door formed of two jambs of small dimensions, whose external face bearing a rough hewn sphinx, was turned toward the palace or temple itself, and contrary to the first ones, which look toward the plain. The internal face, looking toward the vestibule, bore a warrior with a short tunic, a round cap and recurved shoes.

Unfortunately, these sculptures, which were buried under the earth, were defaced, and especially so friable that the pick broke the cap and ankles and mutilated the poor guard in measure as it exhumed him. From the débris collected in the black and humid earth of our excavations, it seems that at the side of each jamb, to the left and right, in the space that connected it with the wall of the vestibule, there was placed another bass relief representing a second guard identical with the first. Upon the whole, it is our opinion that this second door, which gave access to the closed part of the edifice, was guarded by four human figures, two to the right and two to the left, representing archers or other soldiers.

Beyond this door our excavations yielded us nothing further. It would seem as if the important work of decoration had stopped there, and that the tell, ready to receive an edifice, had never supported anything else except the present miserable village.

To what race belonged the Hetean people to whom these sculptures are attributed and who have been identified with the Khetas or Hittites of the Bible? Now, according to the researches that have been made by the erudite, it would seem that the Hittites were neither Aryans nor Semites. The type figured both upon the Egyptian monuments and upon their own bass reliefs confirms this opinion and gives the Heteans in all likelihood a Turanian origin. To judge from their beardless faces, plaited hair and heavy aspect, they were probably a people of Mongolian origin. The

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Heteans were never handsome, but their type became necessarily modified through the ages, and where they have come into contact with Semitic peoples they have, to a greater or less extent, taken the impress thereof. It results from the deep studies of which the Heteans have been the subject that at an epoch anterior to that of the organization of the Hebrews into a nation, and even anterior to the conquest of Canaan by the Israelites, they played an important part in the great strifes with the Egyptians. The Heteans and Amoreans appear to have been intimately connected in the mountains of Palestine.

It is probably in the train of its adoption by the Turcoman emirs that the doubleheaded eagle, set apart from the remotest antiquity for the divinities and kings of the Hetean nation, was brought home by the crusaders in the fourteenth century. It is thus that it became the emblem of the empire of Germany, and later on that of the empires of Austria and Russia, perpetuating in this way its high symbolic destiny through the ages.

One of our interesting discoveries at Euyuk was that of two stones bearing Phrygian inscriptions, the longest that are known after that of the tomb of Midas.

NOVEL USE OF THE TELEPHONE.

On the occasion of the celebration of the twenty-fifth anniversary of the Chicago fire in Chicago, on October 9, the telephone transmitter was brought into use in rather a novel way.

At the telephone building, 203 Washington Street, by which the procession passed, were fixed four long distance transmitters behind large sound collecting funnels, similar to those used on phonographs, two or three being attached to the balcony of the building and one suspended by wires over the center of the street, as shown in our illustration, said to be nine feet long and four feet in diameter at the large end. Above this was suspended the banner on which were the words, "Your cheers here will be heard throughout the Union." All of the transmitters were operated by storage batteries, and were connected to long distance wires leading to New York and the most distant points west. For five hours and a quarter the procession passed under this transmitter, and a continual stream of music from the different bands, combined with the cheers of the processionists and spectators, was sent over the wires, going to New York, Boston, Philadelphia, to Canton, Ohio, the home of one of the presidential candidates, and to many other places. On seeing the banner over the transmitter, the approaching drum major of each band would change the rattle of drums to some pleasing patriotic air, to be heard by the many listeners in distant cities. In this city and other eastern points it is said the words of the cheers as well as the music of the band was plainly heard.

A TELEPHONE STREET MUSIC TRANSMITTER, CHICAGO CELEBRATION.

Probably no event was ever before so widely distributed by means of the telephone. This event recalls to our attention the difficulty experienced in the early days of the telephone, before the time of metallic circuits, when a successful effort was made to transmit the sermon of Henry Ward Beecher from the platform of Plymouth Church as far as Elizabeth, New Jersey, by means of two Blake transmitters affixed to the pulpit, a distance of but fifteen miles, over an ordinary telegraph wire. The transmission of the Chicago celebration so readily as has been stated is a striking example of the remarkable progress that has been made in the art of telephony within a decade. We are indebted to the Western Electrician, of Chicago, for the use of the illustration. The small picture in the corner is of the press review stand, at which a transmitter was also located. The arrangements for transmitting the sounds were made by S. G. McMeen, engineer of the Central Union Telephone Company, and the Chicago Telephone Company.

THE British consul-general at Frankfort, in the course of his latest report, states that the cost of a civil engineer's course, including that of living, is estimated at 6,000 marks for four years. At other German universities the cost would be somewhat less, but the difference would not be very great, for the main item—the cost of living—is very much the same in all university towns. Foreign students often prefer the smaller universities, especially those in South Germany.

Sanitary Engineering.

The existence of a separate body of professional men devoted to sanitation is one of the evidences of the improved conditions under which we live. There was a time, not so distant but it is well within the memory of many people living to-day, when the profession of sanitary engineering as such did not exist. The architect who designed the homes, and the engineer who looked after the cities, were supposed to provide for the comfort and convenience of the householders; but the idea of a separate profession, whose duty it should be to advise upon those features of a house or a city which concern the health and cleanliness of the people is modern, and has only taken practical shape of recent years. The growth of this branch of engineering is not due to any deliberate effort to create a separate profession; but rather to the growth of intelligent knowledge of the laws of sanitation, and the demand of the public that these laws shall be followed in the construction of their homes, and is one thus affecting their municipal well-being. The public enlightenment has come as the result of the teachings of science and bitter experience. While medical men have been urging the need for pure water supply, good drainage, and abundant ventilation, the scourge of epidemic has descended with a terrible persistency to indorse their teaching. The board of health, with its statistics of sickness and mortality, has proved to a demonstration that there is an intimate relation between a city's drainage and its death rate, and that hygiene and health go hand in hand.

The birth of the present movement in favor of improved sanitation took place within the present half century, and indeed its best work has been done in the past twenty-five years. This is clearly evident if we compare the average dwelling of the earlier period with the average house of to-day, especially if the comparison be made in the homes erected for the middle and working classes. Household conveniences, which were then to be found only in the homes of the rich, are now at the command of the laboring man, and it will soon be a rare occurrence for a cottage to be built which does not contain a bathroom, open plumbing, and a heater in the basement.

Of all the sanitary improvements affecting the public health in cities, there is none to equal that which has been made in the matter of water supply; for while it is true that open plumbing, improved closets, and the domestic bath are vital to public health, it must be remembered that their existence is only possible where there is an abundant supply of water. It is in the volume as well as in the quality of water supply that we have advanced; and the one was as necessary as the other.

The higher death rate of former years was largely due both to the scarcity and the impurity of the public water supply. It frequently happened that this supply was pumped from an adjacent river, that was carrying the drainage of towns and villages which lay nearer its source. The water was distributed to the city mains without sufficient filtration, and to the chemical impurities was added a larger or smaller amount of organic matter, which was an easy breeder of typhoid and kindred diseases. River supply was supplemented by so-called wells, which were often mere cisterns for the catching of surface rainfall, and such filth as might enter by seepage from adjacent sewers or the neighboring stable or burial ground. To-day the water supply of a great city is gathered high up among the hills, at the uncontaminated headwaters of the rivers. The supply is frequently impounded at a point from fifty to one hundred miles from the city. New York City draws its supply from the Croton River, forty miles distant: Liverpool has its Vyrnwy reservoir situated seventy miles distant among the Welsh hills, and to the south of Vyrnwy it is now proposed to create enormous reservoirs for the supply of London, and build some two hundred miles of aqueduct to carry the water.

Closely related to the water supply is the matter of house and city drainage. Open plumbing and self-flushing closets have been the death blow to many diseases which formerly lurked in inaccessible drains, and the pernicious, boxed up closets of the last generation. It used to be that the periodical return of sickness to a home would be ultimately traced (as well it might be) to "defective drainage;" and the general tearing up and reconstruction which followed was but a half cure for defects which called for an abundant flushing with water, that the city's limited supply was unable to give. And the reform which has purified the house has extended to the city. The cesspool is growing mercifully scarce (at least in America and England), and the public are fast awakening to the fact that the discharge of sewage into a river is fraught with danger to every city or hamlet that is built upon its banks. The triumphs of sanitary engineering are nowhere more manifest than in those elaborate plants which have been established for the purification of sewage and the recovery of its organic matter as a valuable commercial product.

Side by side with the improvement of drainage and water supply, has come a better knowledge of the laws of ventilation and improved methods for securing it. The low ceilings and cramped passages of the last generation have given place to lofty rooms and commodious halls. Time was when in designing a house the provision of sleeping accommodation was almost an afterthought. The junior members of a household were crowded into small, stuffy rooms, and the domestics found a couch where they could—generally in small attics tucked away in the angles of the roof. But improved sanitation may justly claim to have changed all that, and in addition to removing the noxious gases which arose from defective drains, it has taught the need for large, airy, and wholesome sleeping rooms. We find to-day that the bedrooms are among the finest in the house, lofty, well lighted, and with means for regulating the temperature in the winter months.

In thus reviewing the progress of sanitary engineering, it must be borne in mind that its benefit is not merely a negative one. It has diminished the amount of disease, and it has cut down the death rate; but, over and above this, and perhaps greatest blessing of all, in purifying and sweetening the surroundings of their daily life, it has brought a permanently bettered condition of morals and character to mankind at large.

The Test of the Long Range.

In order to test the efficiency of infantry fire at long ranges under certain circumstances, an experiment was made in Switzerland by firing from the hamlet of Replands, at an altitude of 3,760 feet, at a surface of snow, about a mile and a quarter off as the crow flies, at the foot of the Mont de Baulmes. The target was a rectangle 165 feet wide by 200 feet deep, sloping at an angle of 10 deg., and was marked at the four corners by flags, and rendered more conspicuous by a piece of black cloth, 8 feet by 10 feet, spread at the base of the rectangle. Fourteen medium shots were told off to fire independently a total of 500 carefully aimed shots within sixteen minutes, between 2:15 and 2:31 P. M., the weather being very fine, with bright sunshine and a dry and perfectly calm atmosphere. The thermometer indicated 20 deg. Fahrenheit. The snow was hard frozen, smooth, and free from any mark, and the slightest graze of the surface was distinctly visible, so that every hit could be clearly traced. It was found that out of the 500 shots, 338, or 67 per cent, had hit the target, besides twenty which had struck above, and twenty-six which had struck below the rectangle, within a radius of about 30 feet. The remaining shots struck within about 100 yards, either short or over the target, while a very few had deviated sideways.—La France Militaire.

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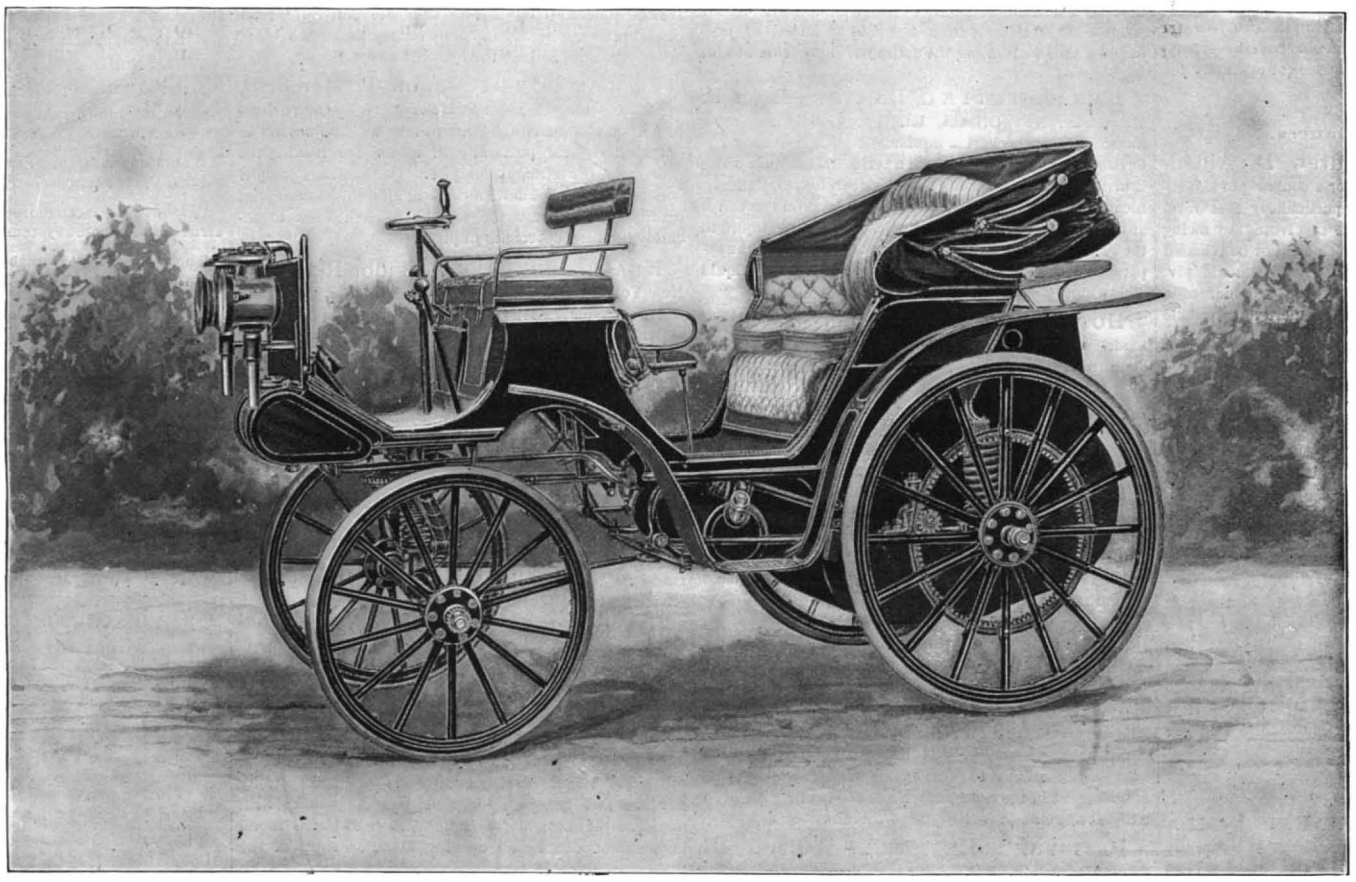
A DAIMLER HORSELESS CARRIAGE.

The horseless carriage shown in the accompanying illustration formed part of the exhibit of the Daimler Motor Company at the recent exhibition of the American Institute. It is arranged to carry four persons, and it is driven by a Daimler motor at speeds of six, ten, fourteen, and eighteen miles an hour. The motor is carried in the casing which is seen at the rear of the carriage, and is completely inclosed. The tanks are arranged one on each side of the motor, and as this work is painted with the same high finish which characterizes the whole carriage, it harmonizes with the general design.



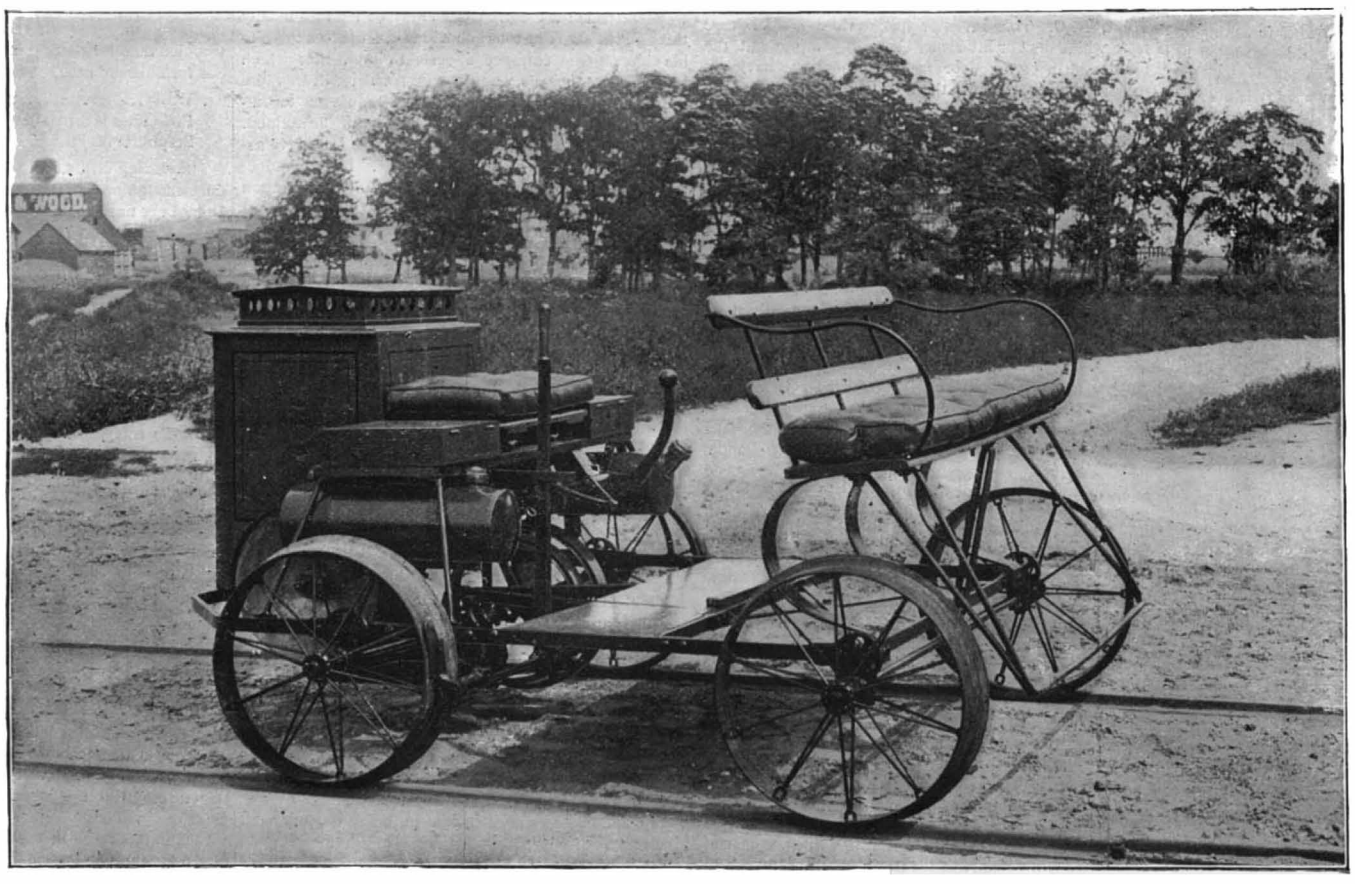
A DAIMLER HORSELESS CARRIAGE.

The French Horseless Carriage Race.

The third annual horseless carriage race from Paris to Marseilles and back—a total distance of 1,073 miles—was started on the 24th of September. In pursuance of the programme, all the competing autocars started at nine o'clock from the Arc de Triomphe, and proceeded in company to Versailles, from which the final start took place at eleven. Thirty-two autocars put in appearance, of which only two had steam power, the rest using petroleum. The race was finished on the 3d of October. The first vehicle to arrive was the motor tricycle of M. Michelin, the time being seventy-two hours. In the SCIENTIFIC AMERICAN SUPPLEMENT for the current week will be found a full account of the race reported by the Engineer, of London.

A GASOLINE INSPECTION CAR.

Railroad men, who have been accustomed to do their inspection on the common type of inspection car, will appreciate the appearance of a light, portable car that is driven by a motor and will save the hard labor of "pumping" by hand and foot. The inspection car shown in our engraving is mounted on a light iron frame, which has a roller bearing upon the axles. The front seat, which is large enough to carry three inspectors, is mounted on easy springs and is provided with a foot rest, which is bolted to the bottom of the seat. The seat for the driver is placed above the rear wheels, and beneath it, one on each side, are the two tanks for fuel and water. The motor, which is of two horse power, is carried in a box casing behind the rear seat. The car is regulated for two speeds, seven and fifteen miles an hour. The car and motor are built by the Daimler Motor Company.



A GASOLINE INSPECTION CAR.

A DISPATCH from Zermatt, Switzerland, dated September 11, states that Prof. Grunert, while ascending the Lyskamm with two guides, fell from a glacier and was killed.

The Free Determination of Minerals.

The Colliery Engineer, with commendable enterprise, offers to name minerals for its subscribers. The SCIENTIFIC AMERICAN has been doing this for many years. Correspondents have not, however, used sufficient care in selecting and marking specimens. The following excellent rules, which must be observed by those sending minerals for determination to the editor of the Metal Mining Department of the Colliery Engineer, apply with equal force to the correspondents of the SCIENTIFIC AMERICAN.

"Specimens of rock must not be less than one inch in diameter. Smaller pieces are generally hard to determine. Fresh specimens of rock are more determinable than rusty, oxidized, or weathered samples; as a rule, therefore, it is well to chip off a fragment a few inches or even a foot or more below the weathered surfaces, where the rock appears fresh, and the crystals composing it are sharply defined. There are some cases, however, where a weathered surface shows the constituent crystals better than the interior of the rock. The sender should accompany the specimens with a letter describing the locality, the mode of occurrence of the rock and other facts. For example, he should state whether the sample came from a dike cutting through other rocks and apparently of igneous and eruptive origin; whether from a series of sedimentary strata or whether from an overflow of lava capping certain rocks. Rough sketches might accompany such descriptions. Samples will not be returned, unless request is made to do so and stamps are inclosed to cover the postage or expressage and cost of packing therefor. Duplicates of the samples, correspondingly numbered, should be kept by the senders. Specimens must be numbered and have a label attached containing the name of the sender, locality, etc. The answers to questions and the determination of the specimens received will be printed with the initials of the sender as follows:

J. S.—Specimen No. 1, from Georgetown, Colorado. Gray granite, composed of mica, quartz, and feldspar. A metamorphic rock.

No. 2, from Mount Lincoln, Colorado. Quartz-porphyry, composed of distinct, perfect crystals of gray quartz, pink feldspar and some black hornblende, set distinctly in a finer grained paste or ground mass of the same minerals. An igneous and eruptive rock occurring in dikes and sheets.

No. 3, from Denver, Colorado. Red sandstone, composed of quartz grains cemented together by red oxide of iron. A sedimentary water formed rock. Occurs stratified. The editor only undertakes to name average rocks such as can be fairly determined at sight. Obscure and rare specimens involving elaborate microscopic sections or chemical analysis will not be attempted. Neither is it always possible to determine with absolute precision and certainty a small fragment of rock perhaps more or less weathered or decomposed. In such cases, the sender must be content with the provisional determination that it appears like such and such a rock. As to whether the rock is likely to be orebearing or a good or poor feature in a mine, the editor may sometimes be able to give an opinion. Long descriptions of mines or properties are rarely intelligible and we are often compelled to answer such communications by saying that we can give no opinion without personally visiting the locality. Questions involving an expert opinion on mining property, for which an expert would be entitled to a fee, will not be answered."

THE most stubborn cases of neuralgia are apt to yield to a hot water treatment. Wherever the pain is located, there a hot water bag should be applied. The suffering part should be wrapped in a blanket, and the unfortunate patient should be put to bed and covered with more blankets and induced to drink at least three cups of water as hot as the palate can stand. This treatment may seem severe, but it is sure to bring relief.

IT was announced at a banquet given to Dr. Nansen at Christiania that a Nansen fund had been formed for the advancement of science. Subscriptions to the amount of 210,000 kroners had already been received.

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RECENTLY PATENTED INVENTIONS.

Engineering.

ARRIAL RAILWAY.—Ignacio M. de Oca y Melian, New York City This invention relates to constructions in which the cars are suspended from a cable and have a trolley which runs on the cable, and provides for the use of double hangers, increasing the safety of the traffic, and for novel movable supports for the cable, whereby the path will be cleared for the hangers as the car passes the supports, without leaving the cable unsupported at any time. The invention also covers improvements in the trolley and novel means for operating the movable supports.

Railway Appliances.

CAR COUPLING.—Andrew D. Alden, Brockport, Pa. This patent is for a coupling of the automatic latching type, and more particularly that form wherein a coupling jaw or knuckle is pivoted to swing laterally in the drawhead to interlock with or be released from a knuckle on a similar coupling. A knuckle pivoted to the drawhead is engaged by the shoulder of a rocking dog having a spiral channel where the knuckle is moved into operative position, a tripping bar sliding in the drawhead under the dog and having a toe adapted to engage the spiral channel and rock the dog to release the knuckle. The drawhead of this coupling is without any opening in its upper side, and hence it is not liable to be obstructed by snow, ice, etc.

BLOCK SIGNAL SYSTEM.—Joseph E. Donbavand, Millville, N. J. In connection with the usual danger and caution signal circuits, this invention provides for the employment of auxiliary signal circuits and signal mechanisms which may be located at various points in the blocks, such auxiliary signaling mechanisms being adapted to be actuated by a train in the rear of the point at which the signaling mechanism is located, so as to indicate the approach of a train. The invention also provides for improvements in the mechanisms as well as in the arrangement of the circuits, rendering the system more simple, inexpensive and positive. It is adapted for employment on both single and multiple track roads.

Electrical.

SHADE HOLDER FOR ELECTRIC LAMPS.—Morris D. Greengard, St. Louis, Mo. To secure the shade in the desired position without the use of screws this inventor has devised an improvement according to which the lamp socket has a shoulder, and the holder has arms with bearing portions at their free ends, while a ring fitted on the socket above the shoulder has cams engaging the bearing portions. The ring may also be provided with spring clasps and slides movable independently of the ring and clasps.

ELECTRIC RAILWAY SYSTEM.—Barton R. Shover, Indianapolis, Ind., and Frank P. Townsend, Asbury Park, N. J. According to this improvement the main electric wire and circuit closing devices are placed in a conduit between the rails, or near one of them, and all parts from which danger by contact would come are placed in a closed circuit, the circuit closers being closed by an electro-magnet carried by the car to convey the current through the car motor. As the car passes along the contact stripe are successively elevated, and the working rail sections are so short that there can be no danger from them to one in front or in the rear of a car.

Agricultural.

HAY FORK OPERATING DEVICE.—John F. Tuttle, Springdale, Washington. To dispense with the derrick teams used in connection with thrashing machines for the operation of the fork, this inventor has devised a mechanism, the driving pulley of which is mounted on a tumbling rod, whereby a shaft is operated carrying pulleys of three or more diameters, around either one of which the rope attached to the fork may be run, and easily changed from one to the other. The device does not allow the fork to interfere with the table tenders of the machine, enables the fork to take up a much larger load than heretofore possible, and to be used with more certainty, insuring the safety of the forker.

THRASHING MACHINE FEED.—George W. Rucker, Belle Plaine, Iowa. In feeding attachments for thrashing machines this invention provides an improved device of simple and inexpensive construction, having means for cutting the bundles and feeding the grain to the separator, designed to increase the capacity of the machine and give better results. Within a casing which supports one end of a carrier is a knife drum, below which is a conveyer having its rear end vertically movable, the carrier being at a proper elevation to feed the material into the casing, and being operated by four men, two on either side. The sheaves are straightened out automatically in case they strike on end, and the cut material is fed to the pickers and thence to the separator.

Miscellaneous.

DENTAL TOOL AND PLUGGER.—James W. Dennis, Cincinnati, Ohio. This is an instrument especially adapted for taking up and holding pads or plugs for introduction into cavities in the teeth, particularly those which absorb surplus mercury from amalgam fillings, the tool facilitating the locating of the plug or pad in a tooth cavity without causing pain.

BADGE.—Oliver T. Eads, Harvey, Ill. This is a device to be attached to the coat or vest and representing the head and bust of a man, the arrangement being such that by drawing down upon a string the neck portion will be drawn out or elongated. The device is designed to afford amusement or to serve as a hint to a questioner that further questions are not desired.

HAIRPIN.—Frank J. Prokop, Dolgeville, N. Y. This invention relates especially to pins having ornamental heads, or to be worn as ornaments in the hair, and is made in two sections, a stem or shank section and a shell casing or receiving section constituting the lower portion of the pin. The pin may be readily placed in the desired position in the hair and then locked in such position.

CALCULATOR.—Wesley A. Copeland, Cyrus Roberts, and Thomas J. McCrary, Alvord, Texas. In this device a bar on which is a series of numbers slides in a frame or base which is also provided with a series of numbers, there being a sliding lever or pusher for moving the sliding bar. The sliding bar is provided with a longitudinal serrated plate, and the lever or pusher movably secured to the frame is adapted to be swung into engagement with the serrated plate. On the base block is a series of peg holes in which amounts exceeding 100 in a single column are to be noted by means of pegs or pins, thus facilitating the adding of long columns of figures.

EVAPORATING LIQUIDS.—Leon F. Haubtman, New Orleans, La. For quickly absorbing moisture from saccharine liquids, etc., this inventor has devised an apparatus in which a series of inclined plates is arranged in a casing to form chambers having communication with one another, there being a liquid receiver at the end of each plate and means for heating liquid in the receivers, and heated air being forced through the apparatus in a direction opposite to that in which the liquid is flowing.

HOT AIR HEATER.—Adam W. Ringland, Toledo, Ohio. In order to utilize the fuel in a hot air furnace to the fullest advantage, the fire box, according to this improvement, is made with a combustion chamber extending the length of the heater, and having side walls curved inward toward each other, so that their convex sides are contiguous, there being also an interior hot air chamber separated from an exterior hot air circulating chamber, an inlet flue leading into the exterior chamber having a valved connection with the interior chamber. The fire box construction allows for a large grate surface, and its inwardly curved walls present increased radiating surface and allow for larger air spaces behind them.

STRAW BURNING STOVE.—Walter P. Hitchings, Waubay, South Dakota. The fire pot of this stove is composed of angular bars partly beneath the feeder and partly beneath the griddle holes, the inclined rear side of the fire pot being separated from the oven wall and arranged over the entrance of the base flue. A flue passes in front of and beneath the oven, and the heat may be utilized to great advantage in heating pots and pans set in the holes, as well as for heating the oven without scorching articles placed therein.

PASSENGER REGISTER.—William H. Cling, Charleston, S. C. This is a device for registering those entering a car, theater, etc., by means of a plate which is depressed by the stepping on it of those passing in. It comprises a box with spring-supported cover, pendant from which is a hook pawl adapted to engage a ratchet wheel on a shaft, there being also on the shaft removable tape-carrying reels, the tape having printed figures in consecutive order. By inspecting the tape at any time it is readily ascertained how many times the cover has been depressed, or how many people have stepped on it in passing.

VEHICLE STORM GUARD.—Sylvanus Norton, Sinclairville, N. Y. This is a device for attaching the hoods, storm guards or aprons to the dash of a vehicle, consisting of a strap with a clamping device at one end and a take-up lever connected with the opposite end, a second clamping device being connected with the take-up lever. After the guard is attached to the hood, dashboard and body of the vehicle, the latter is practically a closed vehicle, and when the guard is not required to close the entire front it may be used as a pocket, protecting the lower extremities of the occupant.

SHOW CASE.—Frank Gurley, High Point, N. C. This inventor has devised a show case from which dust or litter may be readily swept out, the bottom strip of the door frame at one side having a recess extending down to the floor and cut transversely through the strip to the level of the floor, a block fitting the recess beneath the door.

ICE CRACKER AND SHAVER.—Frederick E. Steere, Lynchburg, Va. This is a simple machine for use in connection with the sale of beverages, facilitating the shaving or cracking of ice as desired. The ice is placed in a hopper through which a plunger carrying a disk with spikes on its face may be moved to force the ice against rotating teeth to break up the ice in small pieces, or a disk carrying knives may be advanced beyond the teeth, when the ice will be shaved instead of being cracked, a crank being turned in both cases.

UMBRELLA.—Rufus Waples, Jr., Philadelphia, Pa. This invention is for an improvement in what are known as umbrellas and canes—the umbrella proper being applied to and removed from a handle which may be an ordinary cane. The ribs are arranged to expand in two opposite sets connected together and the braces are arranged in similar sets connected together, the ribs being arranged in groups to avoid multiplicity of joints, and the ribs and braces being in certain respects constructed and connected alike. The handle may be made hollow to form a sheath for the collapsed and folded umbrella portion, or the latter may be applied to an ordinary cane or staff.

PAINTERS' BLIND HOLDER.—John W. Woodward, South Royalton, Vt. For holding blinds and similar articles while being painted, this inventor has devised a light and simple construction by which a blind of any length may be held and turned to any desired position to facilitate work on it. It has two trestles adjustably united by a connecting bar, and each trestle having an adjustable upright in which is a longitudinal screw turned by a crank arm, while a T-shaped arm centrally pivoted to the connecting bar is adapted to be held in engagement with the side edge or the bottom of the blind.

CURTAIN FIXTURE.—Emsley L. Slight, Ennis, Texas. This invention relates to fixtures in which a spring roller is carried in sliding supports that move up and down on vertical guide strips attached to the window frame, and provides a novel form of sliding head with grooved ways or runners moving over stationary vertical guide strips, there being devices for retaining the journals of the roller in the head and springs to hold the head to any adjustment on the guide strips. With this improvement the curtain may be readily adjusted to shut off the light from either the top or bottom of the window, or any intermediate portion.

HINGE.—Tyree Rodes, Nashville, Tenn. This is a hinge especially adapted for gates, and the patent is for an improvement on a former patented invention of the same inventor. The hinge is made of a piece of stout wire whose middle portion has several coils forming an eye, while its ends are wavy and somewhat divergent and terminate in spurs, being designed for convenient attachment to the gate between braces or end pieces, whereby the body or shanks of the hinge are covered up, leaving the eye only exposed.

SPECTACLES.—John T. Meredith, Shawnee, Ohio. These spectacles have auxiliary temples fitted to slide on the straight temples, and having an outer curved ear portion, with means for locking the sliding to the straight temples. The auxiliary temple, when pushed in, assumes an almost straight position, but readily curves around the ear when pushed out to securely hold the spectacles in place.

HEADS AND MASKS.—Isidor Roescher, New York City. An eye and tongue support for artificial heads and masks or vibratory supports for dolls' eyes and tongues, has been patented by this inventor, in which the supports are so concealed and so attached that the least movement affords vibrations which appear at the openings provided. The artificial eyes and tongue are connected with separately arranged springs within the mask, so that they will not interfere with the action of each other.

Designs.

DESIGN FOR SCRUBBING BRUSH.—Samuel K. Hawkins, New York City. This brush is made in an approximately S-like curve, with pointed ends, and the upper edge is chamfered all around.

SASH WEIGHT.—Robert R. Bren, New York City. This is a weight having at one end specially advantageous recesses surrounding the aperture for the attachment of the sash cord, so that it may be readily secured to the weight without liability to friction against the sides of the pocket in which the sash runs.

BACK BAND HOOK.—Hiram E. Wetherbee, Greenville, Miss. This design is for a substantially flat plate in which are elongated parallel openings with adjacent perpendicular serrations, there being a broad hook surrounded by an opening about centrally of the plate.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

PLANTS AND THEIR CHILDREN. By Mrs. William Starr Dana. New York, Cincinnati, Chicago: American Book Company. Price 65 cents.

Not every book of nature study can be so heartily commended as Mrs. William Starr Dana's "Plants and Their Children." Some educators have gone into raptures over the beauty of flowers, and neglected the study; others have missed the beauty in sordid pursuit of fact; it has remained for Mrs. Dana to hitch her wagon to a star, to teach at once science and poetry. The study of flowers is inherently attractive. It is the study by which the child is most readily attracted, from which he is least liable to be discouraged. That he is so often discouraged speaks ill of his teachers. The flower, says Mrs. Dana, attracts the bee by sweetness and beauty. In the same way it attracts the child. Others may be led into botany through the study of cells and slimes. He leaves these to his elders. One entrance appeals to him, that which leads through flowers, and the wise teacher will lead him in by that. Once in, it will take more than a few technical terms to frighten him from this fascinating flowerland. Yet this book, carefully as it shuns the less attractive aspects of the subject, is not unscientific. It leads inductively to the prime principles. It tells of the formation of the seed, the storing of food, the growth of the infant plant, but all with a living interest, not sentimental, but poetic with the comprehensive poetry of Thoreau and Emerson. The book teaches the child to see. It teaches the observant, expectant mood of the scientist, a mood consonant with the most spiritual religion. The illustrations, by Alice Josephine Smith, are most adequate. The book is in every way most attractive. The book is designed for a supplementary reader. It is easy to foresee the pleasure that the children will find in it. Mrs. Dana is widely known as an authority on the subject of plants and plant life, and her first publication along these lines, "How to Know the Wild Flowers," attained an enormous circulation. We commend the book alike to those who have made such subjects a study and to such as are not sufficiently observing to have become enamored of the plant life about them, or who have not come under the spell of Mrs. Dana's charming style.

LAKE'S HOME AND BUSINESS INSTRUCTOR. Chicago: Laird & Lee. Pp. 372. Price, cloth, 50 cents and 75 cents.

This is a well printed and arranged little handbook in which is compactly set forth many valuable points on penmanship, letter writing, bookkeeping, banking, everyday law, mercantile and technical terms, social forms and speeches, etc. It is somewhat unique in its arrangement and quite original in its treatment of the various subjects, and must be a valuable aid to self-instruction by the young, as well as a handy volume in many ways to have around.

The October number of the Street Railway Journal is more than double its normal size, as the enterprising publishers decided to issue a souvenir number on account of the St. Louis Convention of the American Street Railway Association. The transportation facilities in the city of St. Louis are fully treated and a colored map is provided. The number is filled with interesting matter and is beautifully printed on coated paper. The advertisements, which fill 248 pages, are printed in colored inks. We congratulate our contemporary on the production of a number which is unique in the history of trade journalism. It is published at New York and Chicago.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue

Marine Iron Works. Chicago. Catalogue free.

"C. S." metal polish. Indianapolis. Samples free.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Yankee Notions. Waterbury Button Co., Waterb'y, Ct.

For good letter copies see "Rubber Tipped" adv., p. 340.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Minerals sent for examination should be distinctly marked or labeled.

(6991) W. A. B. asks (1) how to magnetize a piece of thin iron. A. Starting at one end, rub it across the pole of a strong magnet; a dynamo field magnet is excellent. Remove it in a sweeping curve and repeat the rubbing, always in the same direction but changing sides. 2. Do you know of any work published on magnetism that an ignoramus can understand? The encyclopedias have lengthy articles on the subject, the more of which I read the less I know. A. We recommend "Magnetism," by Houston & Kennelly, price $1, which is a very good work and can be readily understood by those not especially trained in electro technics, also "Lectures on the Electromagnet," by Thompson, price $1; "Electromagnet and Electromagnetic Mechanism," by same author, price $6. Much of the above has been given in the SCIENTIFIC AMERICAN SUPPLEMENTS.

(6992) O. F. McG. asks: Will you please inform me through your valuable columns how the electropoion fluid for putting in batteries is made? A. Various formulæ are used. The following is Tissandier's:

Water	100	parts	by weight.
Potassium bichromate	16	"	"
Sulphuric acid 66°	37	"	"

The mixing of the acid and water is supposed to produce enough heat to insure solution of the bichromate. Do not use until cold.

(6993) C. A. P. writes: All things being equal in both cases (that is, speed, load propelled and distance traveled), would the strain on the bicycle chains differ if one bicycle is geared at 70 and one at 80 inches? Would there be any difference in the strain on the chain if the front and the hind gears are transposed, other conditions being equal? A. For equal work as you state, the strain on the chain increases with the increase in the gear; 80 gear exerts a harder pull on the chain than 70 gear. By transposing the gear, the strain would be less on the chain by the difference in the relations of the sprockets.

(6994) G. H. W. asks: How many of the caustic potash batteries described in "Experimental Science" will it take to light a six candle power incandescent lamp, and also what voltage lamp should be used? Will you also inform me how much black oxide of copper should be added to the jar? A. Thirty or forty cells would be requisite. Use about a half inch layer of copper oxide to each jar.

(6995) W. W. P. writes: I am heating with steam from a small upright boiler, and as the steam coils are on a level with, or possibly lower than, the bottom of the boiler, I have practiced the wasteful plan of running the condensation into the gutter instead of returning it to the boiler. I have heard, however, that there is a method by which the condensation can be returned to the boiler in cases like mine. Will you please advise me through the columns of your journal? A. The water in the coils can be returned to the boiler under the conditions you name, by a return steam trap. This apparatus is well known in the steam fitting trade.

(6996) T. S. B writes: We have a 20 inch by 48 inch Corliss engine with Bulkley condenser. We take the condensing water from the Hudson River, with a Worthington duplex steam pump; the steam cylinders are 7 inches diameter, the water cylinders 9 inches, and 10 inches stroke, each piston running about 30 strokes per minute. Steam pressure from 60 to 80 pounds, the gage on pump discharge pipe indicates 40 pounds. The distance the water is carried, about 200 feet; the ele-

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vation, about 80 feet. The pipe is half way 4 inches and the other half 3 inches. The pump has also a Bulkley condenser; the water is taken for it from the lower part of air chamber and is discharged into the suction pipe, giving a vacuum of 15 inches to 20 inches. The vacuum at the Corliss engine is 24 inches to 26 inches. Can you give me percentage of gain under these conditions? I have taken your papers for about 40 years and I have never asked a favor before. A. You do not give sufficient data for exact figures. Your vacuum adds to the engine about 40 horse power and you expend in steam on the pump probably less than 4 horse power in steam. So your gain will be the difference, or 36 horse power. Now, if your engine is 200 horse power without the condenser, you will gain $\frac{36}{200}$ =18 per cent by the use of the vacuum.

(6997) E. E. S. writes: Most men, who have occasion to use screwdrivers, think that, of two screw drivers exactly alike except in length, the longer one will start screws which could not be started with the shorter one. Is this difference real or imaginary? And if real, please explain why. A. The only advantage that the long screwdriver has is in the facility for a strong grip from the hands.

(6998) J. P. J. asks: 1. What two liquids when poured together will ignite with a rose colored flame, and also the reaction which takes place? A. Turpentine and strong nitric acid may be used to produce deflagration. The experiment is highly dangerous. 2. Can you give me the chemical reaction taking place by calc. carb. in H_2O, and the formula for acetylene gas? A. $CaC_2 + H_2O = C_2H_2 + CaO$ or $CaC_2 + 2\ H_2O = C_2H_2 + Ca(OH)_2$. 3. Also can you give me a good preservative for insects, which, when put on, will kill and preserve them? I am now using turpentine and creosote, but do not like the mixture. A. Potassium cyanide is very generally used for killing insects, but is poisonous, and is liable to stain the insects. Chloroform is good, but is apt to cause a stiffening of the wing membranes. Laboulbene recommends for the preservation of insects in a fresh state plunging them in a preservative fluid consisting of alcohol with an excess of arsenious acid in fragments; 1½ pint alcohol will take about 14 troy grains of arsenic. The living insect, put into this preparation, absorbs about 3-1000 of its own weight. When soaked in this liquor and dried, it will be safe from the ravages of moths. Anthrenus or Dermestes. This liquid will not change the colors of blue, green, or red beetles if dried after soaking from twelve to twenty-four hours. Hemiptera and Orthoptera can be treated in the same way. The nests, cocoons, and chrysalids of insects may be preserved from injury from other insects by being soaked in the arseniated alcohol, or dipped into benzine or a solution of carbolic acid or creosote. For spiders, puncture them and steep for several days in a strong alcoholic solution of pure phenol, and then in dilute alcoholic glycerine. Or use a saturated solution of salicylic acid in glycerine; dry carefully.

(6999) E. M. B. says: Can you send me a recipe for hektograph gelatine that will absorb the ink and not require washing? A. Hektograph Sheets.—Soak 4 parts of best white glue in a mixture of 5 parts of water and 3 parts of solution of ammonia, until the glue is soft. Warm the mixture until the glue is dissolved and add 3 parts of granulated sugar and 8 parts of glycerine, stirring well and letting come to the boiling point. While hot, paint it upon white blotting paper with a broad copying brush, until the paper is thoroughly soaked and a thin coating remains on the surface. Allow it to dry for two or three days, and it is then ready for use. An aniline ink should be used for writing, and before transferring to the blotting paper, wet the latter with a damped sponge and allow it to stand one or two minutes. Then proceed to make copies in the ordinary way. If the sheets are laid aside for two days, the old writing sinks in and does not require to be washed off.—Chem. and Drug

(7000) M. C. asks for a receipt for removing writing in ink from paper. A. The Journal de Pharmacie d'Anvers recommends sodium pyrophosphate for the removal of ink stains. This salt does not injure vegetable fiber, and yields colorless compounds with the ferric oxide of the ink. It is best to first apply tallow to the ink spot, then wash in a solution of pyrophosphate until both tallow and ink have disappeared. Thick blotting paper is soaked in a concentrated solution of oxalic acid and dried. Laid immediately on a blot, it takes it out without leaving a trace behind. Tin chloride, 2 parts; water, 4 parts. To be applied with a soft brush, after which the paper must be passed through cold water.

(7001) A. L. F. asks: How to bleach bones to deodorize and take grease out? A. The curators of the anatomical museum of the Jardin des Plantes have found that spirits of turpentine is very efficacious in removing the disagreeable odor and fatty emanations of bones or ivory, while it leaves them beautifully bleached. The articles should be exposed in the fluid for three or four days in the sun, or a little longer if in the shade. They should rest upon strips of zinc, so as to be a fraction of an inch above the bottom of the glass vessel employed. The turpentine acts as an oxidizing agent, and the product of the combustion is an acid liquor which sinks to the bottom, and strongly attacks the ivory if allowed to touch it. 2. How to blue screws such as those used in guns and safe doors. A. The articles to be blued should have their surfaces cleaned and polished. They may be then heated in fine clean wood ashes to a temperature of from 500° to 600°, according to the depth of the color required. It is not necessary to watch the temperature, but simply to examine the articles from time to time to see that when cooled in the air they assume the proper color. They should then be immediately removed, and the operation is then completed.

(7002) H. W. S., Jr., says: Will you give recipe for waterproofing silk fishing lines to prevent them from sinking? A. 1. Two parts boiled oil, 1 part gold size, put in a bottle, shake well, and it is ready for use. Apply with a piece of flannel, expose to the air and dry. After using the line two or three times it should have another coat, the application being repeated when necessary. 2. Apply a mixture of 2 parts boiled linseed oil and 1 part good size; expose to the air and dry.

(7003) H. L. S. asks for a method for removing tattooed marks from the body. A. A writer in the Chemical News has stated that if the tattooing is performed with some carbonaceous matter, the marks can be made to disappear by being first well rubbed with a salve of pure acetic acid and lard, then with a solution of potash, and finally with hydrochloric acid. A dermatologist should be consulted if possible.

(7004) D. A. asks: How can the fingers be best cleansed if stained in photographic development, especially when they have been wet with old or dirty hypo? A. Paint the blackened parts with tincture of iodine, let it remain until the skin becomes red, then apply ammonia, when the stain will disappear. This treatment should not be used if there are any recent cuts on the hands.

(7005) A. G. says: Can you give me the name of any manual on plaster moulding or any information on the finishing up of plaster with paraffine as they are finished in the plaster shops? A. The polish on plaster figures is said to be produced by immersion in melted paraffine or wax, and rubbing smooth.

(7006) F. T. says: Please give me a formula for darkening copper without injuring it. I have some electros of half tones which I want to blacken and then fill hollows with magnesia to use all as a picture. What substance is put on metal (brass) to imitate the color of wrought iron work? A. You can produce a dead black surface on both copper and brass by using ⅛ ounce platinum tetrachloride dissolved in 1 ounce of water. The metal must be chemically clean.

(7007) G. G. Y. writes: I am putting up a line of eight stations. I want to use the Bell receiver for transmitter, there being two at each station, making sixteen in all. Now the question is, will a person hear the message just as plain at one place as at another? The message will have to go through each one. We have up a line where there are two at each end and it works all O. K. How many can we put on the line before we overload it, or cause the sound to be indistinct? A. The message will be heard as well at one place as at another; if the telephones are in series, the operation will be impaired as more telephones are introdnced. The exact number that can be used cannot be stated You can readily experiment with the proposed connections before erecting your line. Try a through metallic circuit with the telephones in parallel with each other, arranged like incandescent lamps.

(7008) E. A. O. asks if there would be any advantage in using mica plates instead of glass plates in the Wimshurst influence machine. A. Possibly, if you could get perfect sheets of adequate size. The experiment would be interesting and worth trying.

(7009) J. J. K. asks how to make the foundation for a walk and what proportion of cement and sand to put on it so as to make it good in all weathers. A. The foundation for a walk (not a street sidewalk) may be made with a layer of very coarse gravel or finely broken stone 3 to 4 inches thick, with a coat cement 1 part, sand 2 parts, 1 inch thick. The gravel or broken stone bed should be wet and well rammed to make the walk permanent. For street sidewalks a thicker bed of gravel or broken stone should be made.

(7010) G. E. B. writes: I have had made to order a few 10 candle power 10 volt incandescent lamps to be run by batteries. 1. Will you kindly inform me as to the amount of amperes needed? A. Allow three and one-half amperes to each lamp. 2. Would six cells, 2 volts each and 5 amperes and 100 ampere hours each, be sufficient and for how long? A. The six cells, if able to maintain the voltage and amperage stated, would answer; presumably for ten hours, possibly for less.

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October 13, 1896,

AND EACH BEARING THAT DATE.

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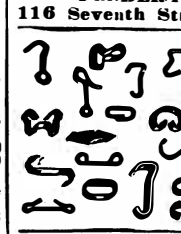

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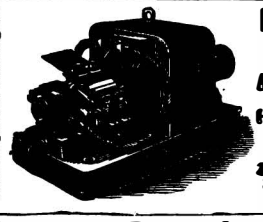

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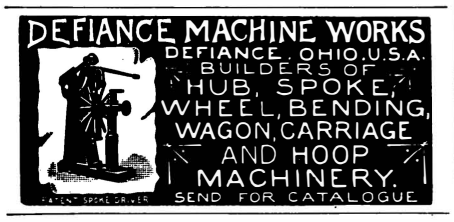
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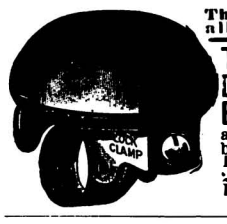

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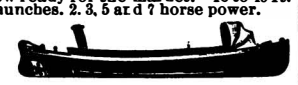

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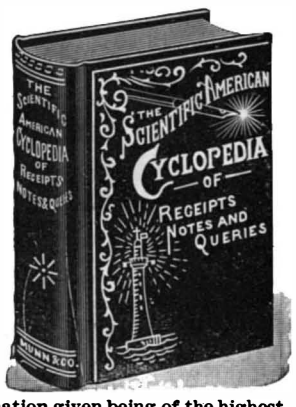

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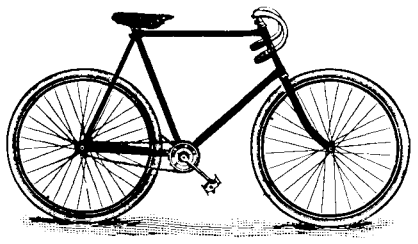

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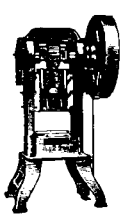

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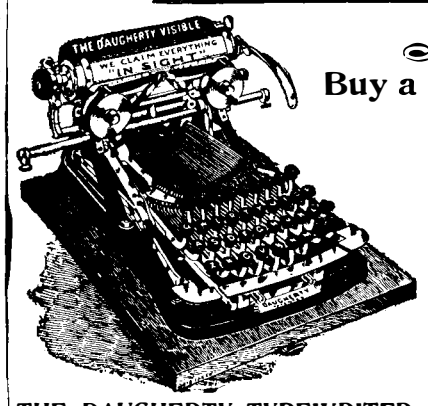

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